

FORM PTO-1390 U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE (Rev 5-93)		ATTORNEY'S DOCKET NUMBER BSG (A) P12AUS														
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371		U.S. APPLICATION NO. (If known, see 37 CFR 1.5) 09/7890619														
INTERNATIONAL APPLICATION NO. PCT/AU00/00054	INTERNATIONAL FILING DATE February 3, 2000	PRIORITY DATE CLAIMED February 5, 1999														
TITLE OF INVENTION VEHICLE EXTERNAL MIRROR ASSEMBLY AND METHOD OF MANUFACTURE																
APPLICANT(S) FOR DO/EO/US Ingmar Manfred BIRGDEN, Garry Gordon Leslie FIMERI, Robert William GILBERT and Duncan William NASH																
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:																
<p>1. <input checked="" type="checkbox"/> This is a FIRST submission of items concerning a filing under 35 U.S.C. 371.</p> <p>2. <input type="checkbox"/> This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371.</p> <p>3. <input checked="" type="checkbox"/> This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).</p> <p>4. <input checked="" type="checkbox"/> A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.</p> <p>5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2)) <ul style="list-style-type: none"> a. <input type="checkbox"/> is transmitted herewith (required only if not transmitted by the International Bureau). b. <input checked="" type="checkbox"/> has been transmitted by the International Bureau. (PCT/IB/308 mailed 10 August 2000). c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US) </p> <p>6. <input type="checkbox"/> A translation of the International Application into English (35 U.S.C. 371(c)(2)) is attached.</p> <p>7. <input checked="" type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)) <ul style="list-style-type: none"> a. <input type="checkbox"/> are transmitted herewith (required only if not transmitted by the International Bureau). b. <input type="checkbox"/> have been transmitted by the International Bureau. c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired. d. <input checked="" type="checkbox"/> have not been made and will not be made. </p> <p>8. <input type="checkbox"/> A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).</p> <p>9. <input type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).</p> <p>10. <input type="checkbox"/> A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).</p>																
Items 11. to 16. below concern other document(s) or information included: <p>11. <input checked="" type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98 with PTO FORM 1449.</p> <p>12. <input type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.</p> <p>13. <input checked="" type="checkbox"/> A FIRST preliminary amendment. <ul style="list-style-type: none"> <input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment. </p> <p>14. <input checked="" type="checkbox"/> A substitute specification.</p> <p>15. <input type="checkbox"/> A change of power of attorney and/or address letter.</p> <p>16. <input checked="" type="checkbox"/> Other items or information: <table border="0"> <tr> <td><input checked="" type="checkbox"/> Preliminary Examination Report</td> <td><input checked="" type="checkbox"/> Copy of Request</td> </tr> <tr> <td><input checked="" type="checkbox"/> Annexes to Pre. Ex. Rep.</td> <td><input checked="" type="checkbox"/> Submission of Formal Drawing(s)</td> </tr> <tr> <td><input checked="" type="checkbox"/> International Search Report</td> <td><input checked="" type="checkbox"/> 6 sheets of formal drawing(s)</td> </tr> <tr> <td><input type="checkbox"/> German Novelty Search Report</td> <td><input checked="" type="checkbox"/> Abstract</td> </tr> <tr> <td><input checked="" type="checkbox"/> 9 copies of citations</td> <td><input checked="" type="checkbox"/> Submission of Incomplete Application</td> </tr> <tr> <td><input checked="" type="checkbox"/> Form PCT/IB/308</td> <td><input checked="" type="checkbox"/> Marked-Up Version of Amended Specification</td> </tr> <tr> <td colspan="2"><input checked="" type="checkbox"/> International Publ. No. WO 00/46072 (Face page only)</td> </tr> </table> </p>			<input checked="" type="checkbox"/> Preliminary Examination Report	<input checked="" type="checkbox"/> Copy of Request	<input checked="" type="checkbox"/> Annexes to Pre. Ex. Rep.	<input checked="" type="checkbox"/> Submission of Formal Drawing(s)	<input checked="" type="checkbox"/> International Search Report	<input checked="" type="checkbox"/> 6 sheets of formal drawing(s)	<input type="checkbox"/> German Novelty Search Report	<input checked="" type="checkbox"/> Abstract	<input checked="" type="checkbox"/> 9 copies of citations	<input checked="" type="checkbox"/> Submission of Incomplete Application	<input checked="" type="checkbox"/> Form PCT/IB/308	<input checked="" type="checkbox"/> Marked-Up Version of Amended Specification	<input checked="" type="checkbox"/> International Publ. No. WO 00/46072 (Face page only)	
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CERTIFICATION UNDER 37 CFR 1.10																
<p>I hereby certify that this Transmittal Letter and the papers indicated as being transmitted therewith is being deposited with the United States Postal Service on this date August 2, 2001 in an envelope as "Express Mail Post Office to Addressee" Mailing Label Number <u>EL469355018US</u> addressed to the: Commissioner of Patents and Trademarks, Washington, D.C. 20231.</p> <p><u>Michael J. Bujold</u> (typed or printed name of person mailing paper)</p> <p><u>Michael J. Bujold</u> (signature of person mailing paper)</p>																

<p>17. ■ The following fees are submitted:</p> <p><input checked="" type="checkbox"/> Basis National Fee (37 CFR 1.492(a)(1)-(5)):</p> <p>Search Report has been prepared by the EPO or JPO \$860.00</p> <p>International preliminary examination fee paid to USPTO (37 CFR 1.482) \$690.00</p> <p>No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)). \$710.00</p> <p>Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$1000.00</p> <p>International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4) \$100.00</p> <p style="text-align: center;">ENTER APPROPRIATE BASIC FEE AMOUNT =</p>				CALCULATIONS	PTO USE ONLY
				1000	
<p>Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).</p>				0	
Claims	Number Filed	Number Extra	Rate		
Total Claims	36 - 20 =	16	x \$18.00	288	
Independent Claims	7 - 3 =	4	x \$80.00	320	
Multiple dependent claim(s) (if applicable)			+ \$270.00	0	
			TOTAL OF ABOVE CALCULATIONS =	1608	
Reduction by 1/2 for filing by small entity, if applicable. Applicant Claims Small Entity Status. (Note 37 CFR 1.9, 1.27, 1.28).				0	
			SUBTOTAL =	1608	
Processing fee of \$130.00 for furnishing the English translation later the <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).			+ 0	0	
			TOTAL NATIONAL FEE =	0	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property			+ 0	0	
			TOTAL FEES ENCLOSED =	1608	
			Amount to be: refunded	\$	
			charged	\$	
<p>a. ■ A check in the amount of <u>\$ 1,608.00</u> to cover the above fees is enclosed.</p> <p>b. <input type="checkbox"/> Please charge my Deposit Account No. <u>04-0213</u> in the amount of \$____ to cover the above fees. A duplicate copy of this sheet is enclosed.</p> <p>c. ■ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. <u>04-0213</u>. A duplicate copy of this sheet is enclosed.</p>					
<p>NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.</p>					
<p>SEND ALL CORRESPONDENCE TO: <u>Michael J. Bujold</u></p> <p>Michael J. Bujold – Registration No. 32,018 Davis & Bujold, P.L.L.C. Fourth Floor 500 North Commercial Street Manchester, NH 03101-1151 Telephone (603) 624-9220 Telefax (603) 624-9229</p> <p>PATENT & TRADEMARK OFFICE</p> <p> 020210</p>					

08/02/01

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of : Ingmar Manfred BIRGDEN, Garry Gordon Leslie FIMERI,
Serial no. : Robert William GILBERT and Duncan William NASH
For : VEHICLE EXTERNAL MIRROR ASSEMBLY AND
Docket : METHOD OF MANUFACTURE
Docket : BSG (A) P12AUS

BOX PCT

The Commissioner of Patents and Trademarks
Washington, D.C. 20231

FIRST PRELIMINARY AMENDMENT

Dear Sir:

By way of preliminary amendment, please amend the above identified application as set forth below.

Substitute Specification:

Accompanying this response, please find a clean form substitute specification, without markings thereon, along with a copy of the original specification which shows the additions and deletions to the original specification and numbers each of the paragraphs of the original specification. The substitute specification does not include any new subject matter and only includes the same changes which are indicated on the enclosed marked-up copy of the original specification. Please enter the substitute specification into the record of this case.

In the Claims:

Please cancel claims 1-34, without prejudice or disclaimer of the subject matter therein, in favor of new claims 35-70 as follows.

35. (NEW) A vehicle external mirror assembly comprising:

a head;
a mount for attaching said head to a vehicle; and
a mirror;

said head comprising:

a molded thin external plastic shell; and
a foam core, said foam anchoring and supporting said shell.

36. (NEW) The vehicle external mirror assembly according to claim 35, further comprising a load diffuser extending laterally into said foam core from said mount,
wherein, in use, loads acting on said head are transmitted through said foam to said load diffuser.

37. (NEW) The vehicle external mirror assembly according to claim 36, wherein said head is pivotable with respect to said mount.

38. (NEW) The vehicle external mirror assembly according to claim 37, wherein the interior surface of both said front and rear shells are rough to improve adhesion to said foam.

39. (NEW) The vehicle external mirror assembly according to claim 37, where said mount has a pivot assembly receiving portion, a vehicle body abutment and connection portion, and a body, said body comprising:

a molded thin external plastic body shell; and
a second foam core, said second foam anchoring and supporting said body shell.

40. (NEW) The vehicle external mirror assembly according to claim 36, wherein the stiffness of said diffuser reduces from adjacent said mount to its periphery.

41. (NEW) A vehicle external mirror assembly comprising:

a head;
a mount for attaching said head to a vehicle; and
a mirror,
said head comprising:

an external plastic shell;
a foam core, said foam anchoring and supporting said shell; and
a load diffuser extending laterally into said foam core from said mount,

wherein, in use, loads acting on said head are transmitted through said foam to said load diffuser.

42. (NEW) The vehicle external mirror assembly according to claim 41, wherein said head is pivotable with respect to said mount.

43. (NEW) The vehicle external mirror assembly according to claim 42, wherein the interior surface of both said front and rear shells are rough to improve adhesion to said foam.

44. (NEW) The vehicle external mirror assembly according to claim 42, where said mount has a pivot assembly receiving portion, a vehicle body abutment and connection portion, and a body, said body comprising:

a molded thin external plastic body shell; and
style="padding-left: 40px;">a second foam core, said second foam anchoring and supporting said body shell.

45. (NEW) The vehicle external mirror assembly according to claim 41, wherein the stiffness of said diffuser reduces from adjacent said mount to its periphery.

46. (NEW) A vehicle external mirror assembly comprising:

a head;
style="padding-left: 40px;">a mount for attaching said head to a vehicle; and
style="padding-left: 40px;">a mirror;
style="padding-left: 40px;">said head comprising:
style="padding-left: 80px;">a front molded thin external plastic shell;
style="padding-left: 80px;">a rear molded thin external plastic shell meeting said front shell at a joint; and
style="padding-left: 80px;">a foam core, said foam anchoring and supporting said front and rear shells.

47. (NEW) The vehicle external mirror assembly according to claim 46, wherein said joint is an overlapping joint.

48. (NEW) The vehicle external mirror assembly according to claim 47, wherein said overlapping joint is formed from a projection, extending from the edge of one of the front or rear shells, received within a groove within the edge of the other of said front or rear shells.

49. (NEW) The vehicle external mirror assembly according to claim 46, wherein said joint is a butt joint.

50. (NEW) The vehicle external mirror assembly according to claim 49, further comprising a hidden internal chamber formed between edges of said front and rear shells for preventing foam escaping to the exterior of said shells.

51. (NEW) The vehicle external mirror assembly according to claim 50, wherein at least one of said front and rear shells terminates in parallel double edges to provide a double butt joint against the other of said front and rear shells, thereby forming said hidden internal chamber.

52. (NEW) The vehicle external mirror assembly according to claim 48, further comprising a load diffuser extending laterally into said foam core from said mount,

wherein, in use, loads acting on said head are transmitted through said foam to said load diffuser.

53. (NEW) The vehicle external mirror assembly according to claim 52, wherein said head is pivotable with respect to said mount.

54. (NEW) The vehicle external mirror assembly according to claim 53, wherein the interior surface of both said front and rear shells are rough to improve adhesion to said foam.

55. (NEW) The vehicle external mirror assembly according to claim 54, where said mount has a pivot assembly receiving portion, a vehicle body abutment and connection portion, and a body, said body comprising:

a molded thin external plastic body shell; and

a second foam core, said second foam anchoring and supporting said body shell.

56. (NEW) The vehicle external mirror assembly according to claim 55, wherein the stiffness of said diffuser reduces from adjacent said mount to its periphery.

57. (NEW) A vehicle external mirror assembly comprising:

a head;

a mount for attaching said head to a vehicle; and

a mirror;

said head comprising:

a front thin external plastic shell;

a rear thin external plastic shell; and

a foam core, the foam anchoring and supporting the shell.

58. (NEW) The vehicle external mirror assembly according to claim 57, further comprising a porous foam gasket sandwiched between edges of said front and rear shells.

59. (NEW) The vehicle exterior mirror assembly according to claim 58, further comprising a load diffuser extending laterally into said foam core from said mount,
wherein, in use, loads acting on said head are transmitted through said foam to said load diffuser.

60. (NEW) The vehicle external mirror assembly according to claim 59, wherein said housing is pivotable with respect to said mount.

61. (NEW) The vehicle external mirror assembly according to claim 60, wherein the interior surface of both said front and rear shells are rough to improve adhesion to said foam.

62. (NEW) The vehicle external mirror assembly according to claim 59, where said mount has a pivot assembly receiving portion, a vehicle body abutment and connection portion, and a body, said body comprising:

a molded thin external plastic body shell; and
style="padding-left: 40px;">a second foam core, said second foam anchoring and supporting said body shell.

63. (NEW) The vehicle external mirror assembly according to claim 59, wherein the stiffness of said diffuser reduces as its extends away from said mount.

64. (NEW) A method for manufacturing a vehicle external mirror housing, for housing a rear vision mirror, comprising the steps of:

molding a first thin plastic component for use as a front shell;
style="padding-left: 40px;">molding a second thin plastic component for use as a rear shell;
style="padding-left: 40px;">positioning and retaining said first and second shells against each other in an edge-to-edge relationship so as to create an internal void; and
style="padding-left: 40px;">substantially filling said void with foam to form a rigid assembly bonded together by said foam.

65. (NEW) The method according to claim 64, wherein injection compression molding to used to mold both of said front and rear thin plastic components.

66. (NEW) The method according to claim 65, further comprising a sub-step of sandwiching a porous foam gasket between the edges of said first and second shells, whereby said gasket allows the escape of air but not foam from said void.

67. (NEW) The method according to claim 66, wherein said second thin plastic component includes an aperture for receiving a motor mechanism assembly, further comprising the step of positioning said motor mechanism assembly over said aperture and wherein said foam bonds said motor mechanism assembly in position.

68. (NEW) A method for manufacturing a vehicle external mirror housing, for housing a rear vision mirror, compressing the steps of:

molding a pre-form component;

blow molding said pre-form component into a component having the external shape of a said mirror housing;

substantially filling said blow molded component with foam to form a rigid assembly.

69. (NEW) A method for manufacturing a vehicle external mirror housing, for housing a rear vision mirror, comprising the steps of:

molding a first thin plastic component for use as a front shell;

gas assist injection molding a second thin plastic component for use as a rear shell;

positioning and retaining said first and second shells against each other in an edge-to-edge relationship so as to create an internal void; and

substantially filling said void with foam to form a rigid assembly bonded together by said foam.

70. (NEW) The method according to claim 69, wherein injection compression molding is used to mold both of said front and rear thin plastic components.

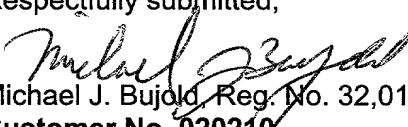
REMARKS

Please consider newly entered claims 35-70. These new claims rewrite the subject matter of the original filed claims to conform with the United States claim practice. Please consider these claims upon substantive consideration of this application.

Accompanying this Preliminary Amendment is a substitute specification which overcomes the informalities noted in the original application. The undersigned avers that the enclosed substitute specification does not contain any new matter.

In the event that there are any fee deficiencies or additional fees are payable, please charge the same or credit any overpayment to our Deposit Account (Account No. 04-0213).

Respectfully submitted,


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T093260 - 04062010

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1C17 Rec'd PCT/PTO 02 AUG 2001
09/890619

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of : Ingmar Manfred BIRGDEN, Garry Gordon Leslie
FIMERI, Robert William GILBERT and
Duncan William NASH

Serial no. :
For : VEHICLE EXTERNAL MIRROR ASSEMBLY
AND METHOD OF MANUFACTURE

Docket : BSG (A) P12AUS

BOX PCT

The Commissioner of Patents and Trademarks
Washington, D.C. 20231

SUBMISSION OF FORMAL DRAWINGS

Further to the filing of this application, enclosed please find six (6) sheets of formal drawings which are to be entered in this case.

In the event that there are any fee deficiencies or additional fees are payable, please charge the same or credit any overpayment to our Deposit Account (Account No. 04-0213).

Respectfully submitted,



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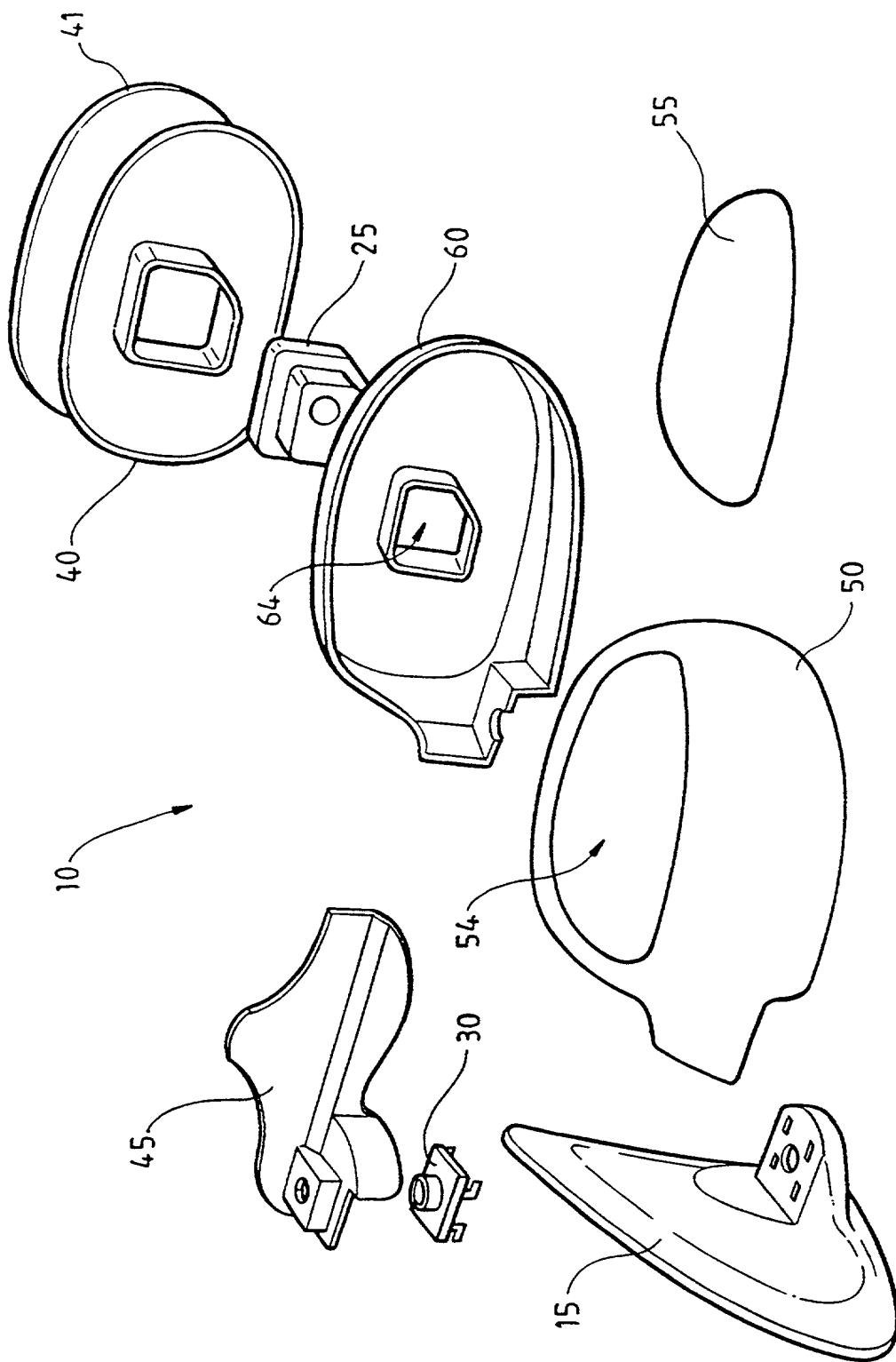
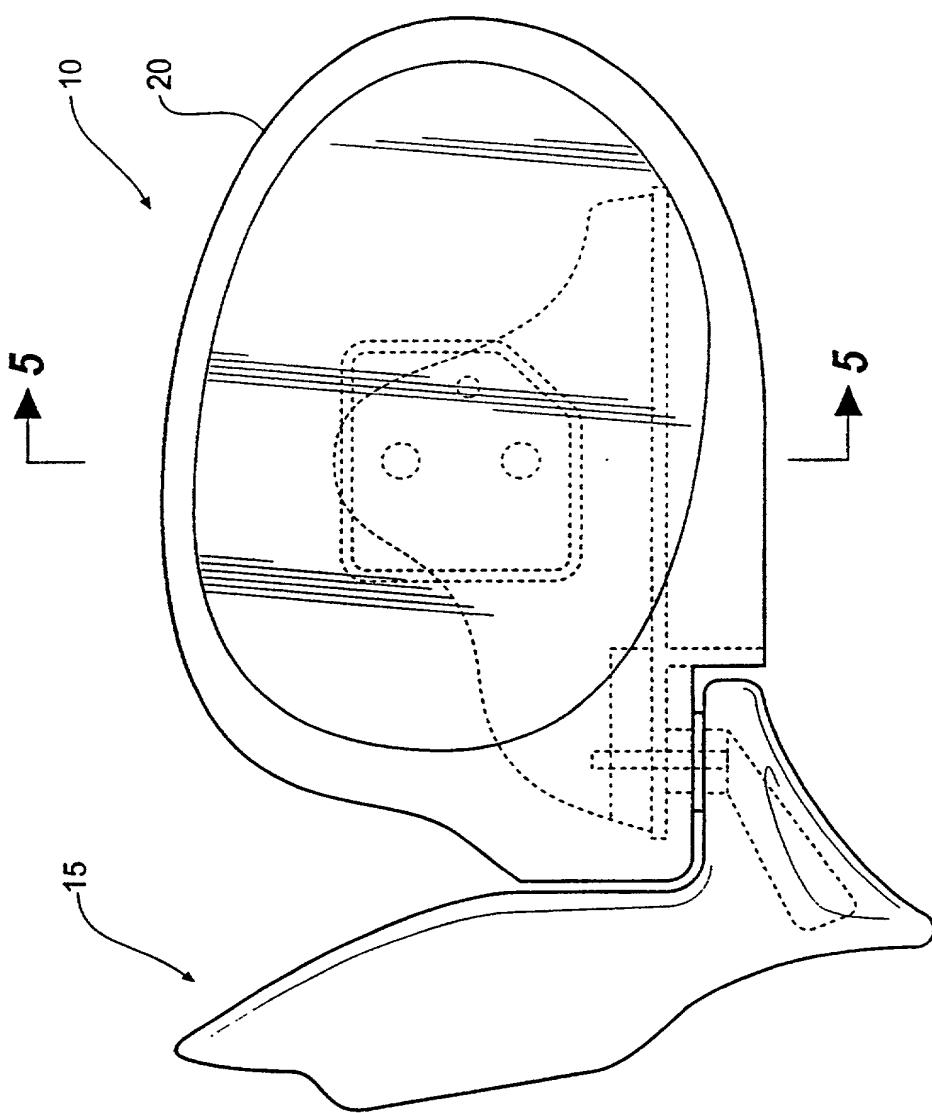
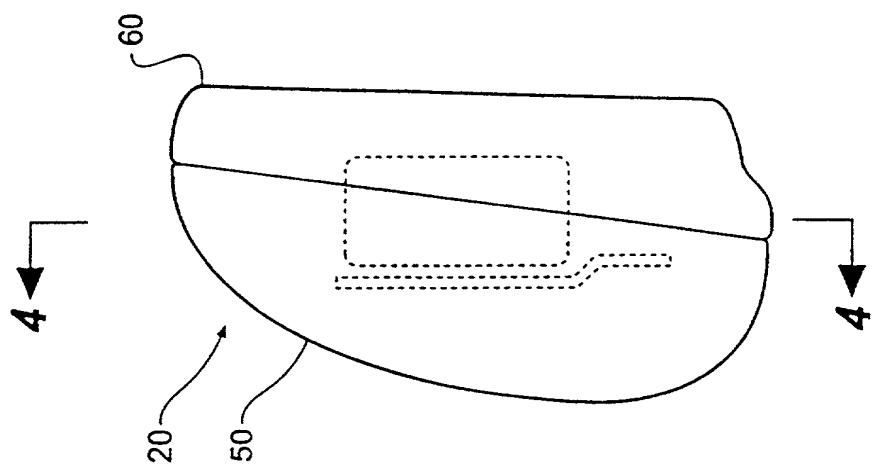


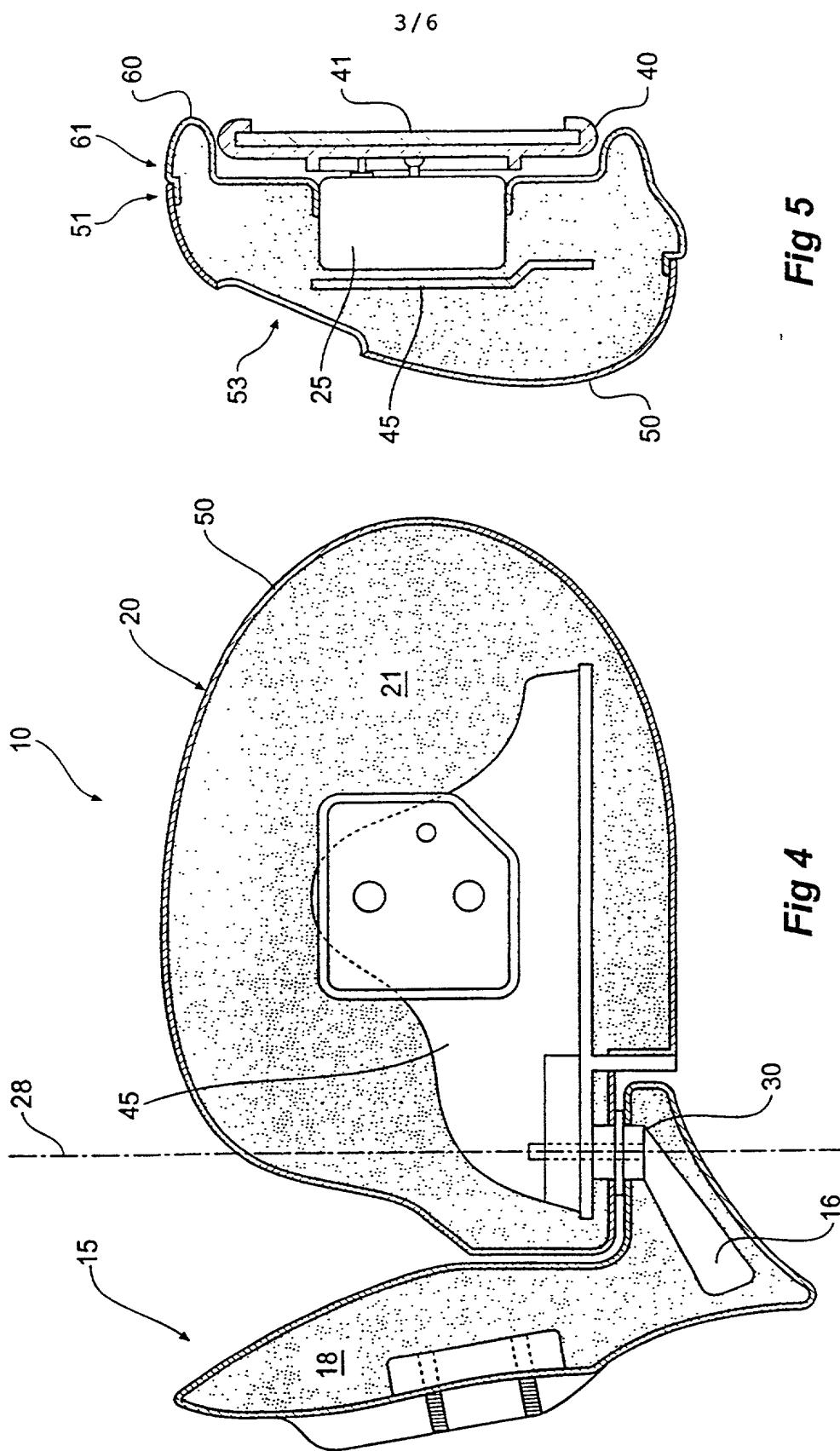
FIG 1

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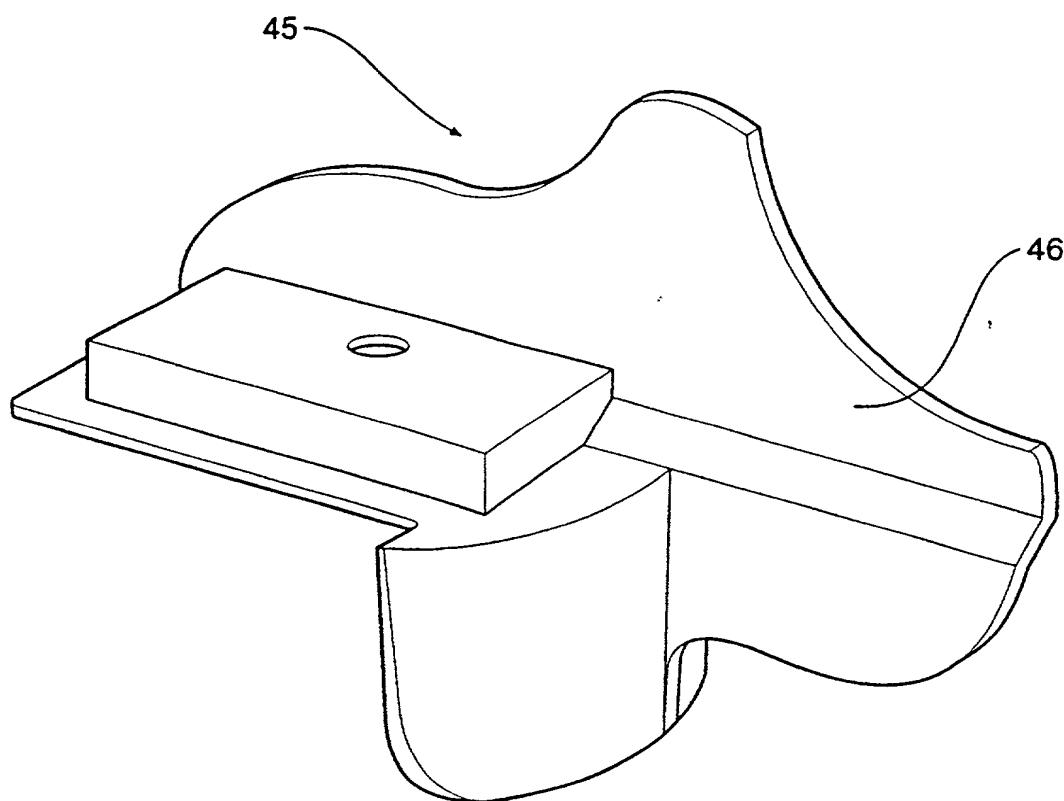
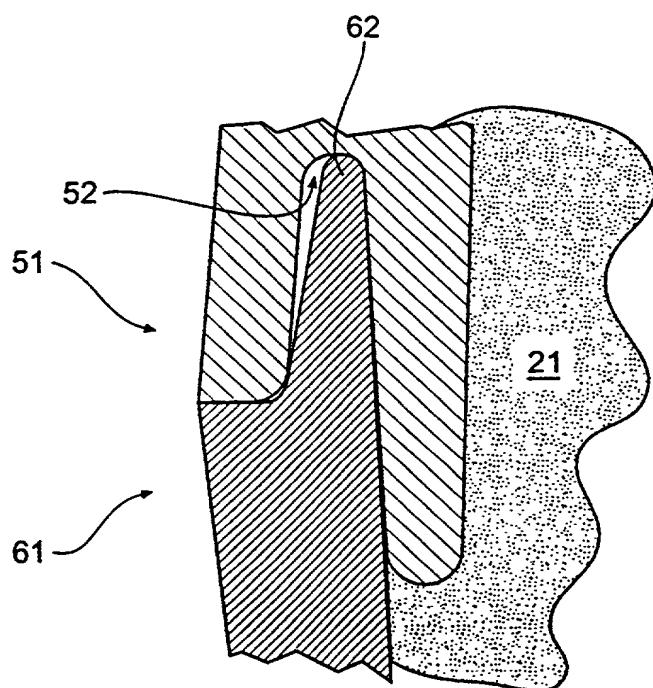
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*Fig 6**Fig 7*

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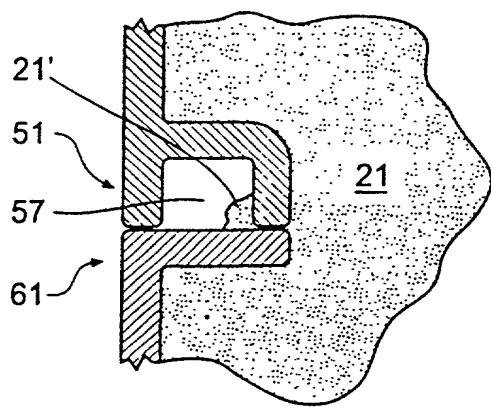


Fig 8

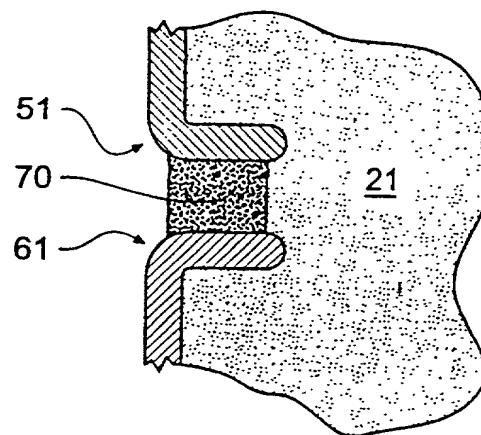


Fig 9

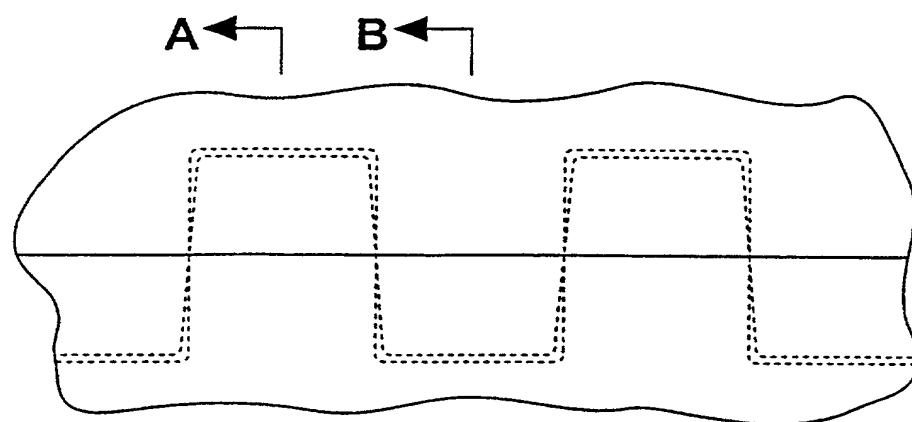


Fig 10

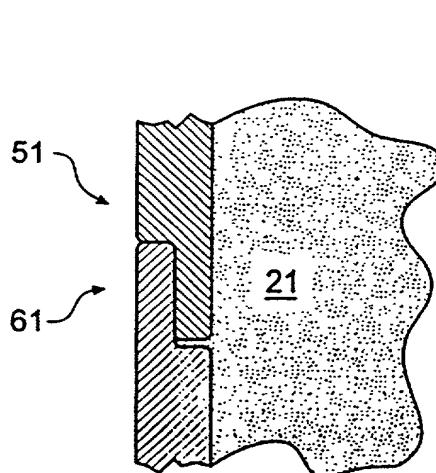


Fig 11

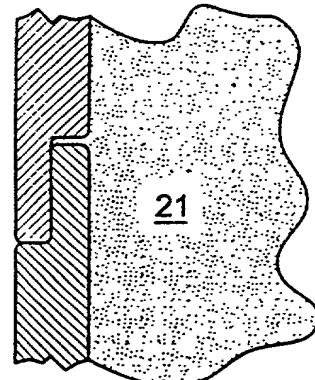


Fig 12

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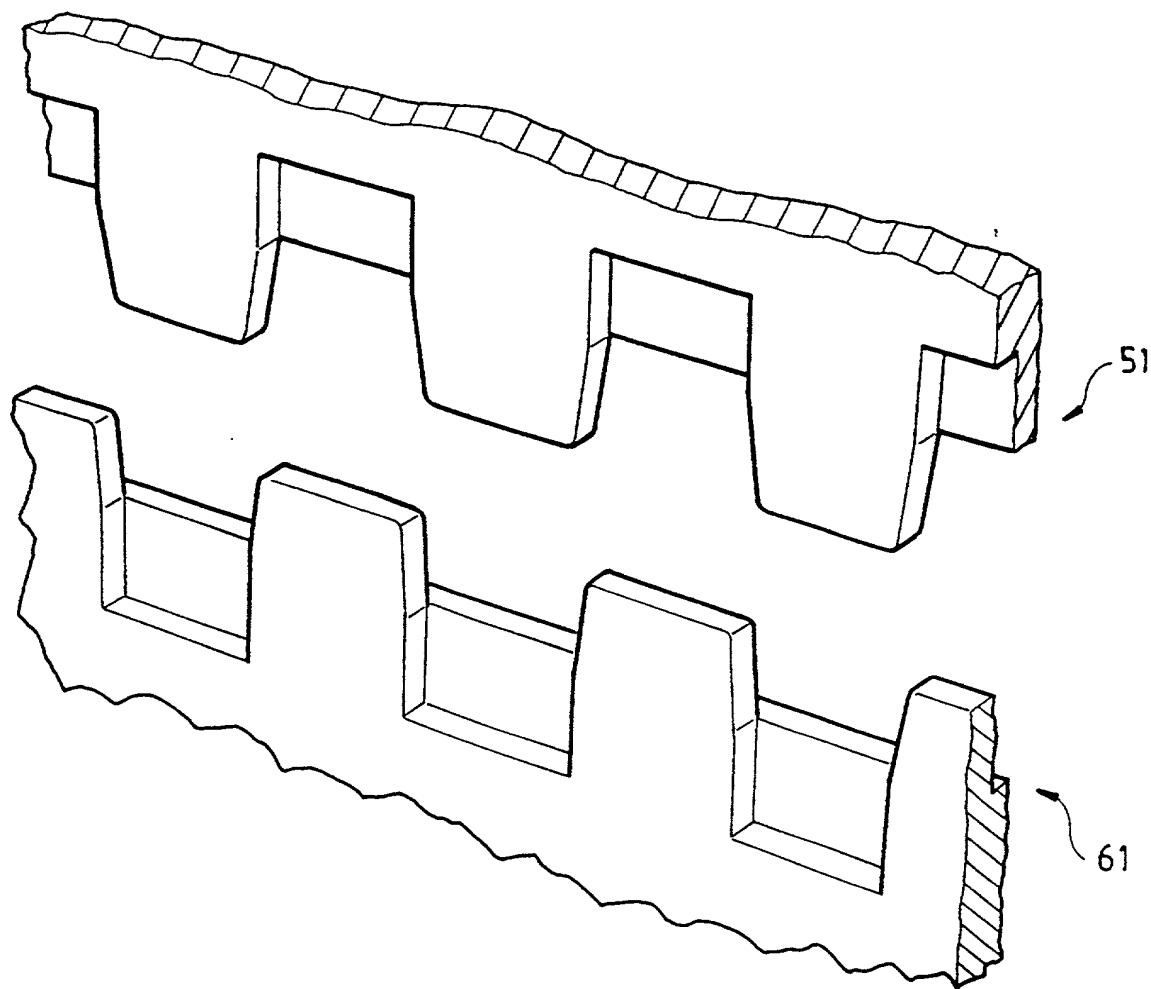


FIG 13

ABSTRACT OF THE DISCLOSURE

A vehicle external mirror assembly (10) comprises three main parts: a vehicle-to-mirror assembly attachment bracket (15), a mirror housing (20) and a mirror (41). Housing (20) comprises a thin molded external plastic shell (50) and a foam core (21), the foam anchoring and supporting the shell. A load diffuser (45) may be positioned within foam (21) to reduce the maximum tensile and compressive stresses within the foam (21). Attachment bracket (15) is of a similar construction with a thin shell (15) internal foam (18) and load diffuser (16).

[001] VEHICLE EXTERNAL MIRROR ASSEMBLY AND
METHOD OF MANUFACTURE

[002] FIELD OF THE INVENTION

The present invention relates to vehicle mirror housings and in particular to vehicle external mirror housings formed from plastic.

[003] BACKGROUND OF THE INVENTION

[004] Vehicle external mirror housings have evolved from simple mounting structures for "wing mirrors" to receptacles for mirrors performing many functions and housing a number of components. For instance, mirror housings commonly house servomotors which are capable of rotating mirrors mounted to the housings about two axes so as to enable the driver to adjust his or her field of rear view. Also external mirror housings commonly are pivotable inward towards the vehicle side in the event of a collision with a solid object and, in some circumstances, automatically upon parking the vehicle to reduce the protrusions from the vehicle's side and its maximum width. Furthermore, equipment such as heaters, antennas and lights may also be supported by the modern external mirror housing. External mirror housings must also be shaped so as to minimize wind noise and so as to minimize drag, while providing an aesthetically pleasing external appearance. As a result, mirror housings have become larger, heavier, more complex and therefore more expensive to produce.

[005] To achieve the functionality and performance required at a reasonable cost, vehicle external mirror housings are usually produced in plastic using injection molding techniques. Typically housings are made from shells of injection molded plastics having wall thickness in the range of 2 to 3 millimeters. Such a wall thickness has been found to provide adequate strength and rigidity.

[006] Many different mirror housing constructions are known. Mirror housings may be formed by two mating structural components, by one cosmetic component and one structural component, or from a single cosmetic/structural component. However generally, mirror housings are produced from at least two mating components, which, when joined, form a hollow shell. Mating bosses, molded into

the shells are usually provided to facilitate alignment and joining of components. Within the hollow shell is provided a mount to enable connection of the mirror housing to a vehicle bracket, which itself is attached to the side of a vehicle. In order to avoid high stresses within the plastic shell, these mounts must be designed so that they distribute load away from the mount itself. This becomes increasingly important as the wall thickness of the plastics shell is reduced.

[007] Vehicle external mirror housings are generally made from shells having mounting and connection bosses which add to the complexity of the injection molding tooling. Furthermore, the injection molded shells, having a wall thickness of 2 to 3 millimeters take a significant time to cool resulting in a cycle time of about 50 seconds. A reduction in wall thickness not only reduces cycle times but also reduces the amount of plastics material used, reduces the cost and reduces the weight of the mirror housing.

[008] An alternative external vehicle mirror construction for large mirrors such as those found on trucks and buses is disclosed by Canadian Patent Application No. 2198267. With this construction, a core is molded from polyurethane foam and subsequently a reinforcing layer "a few millimeters thick" is sprayed on. While this construction may have some advantages for large mirrors, it has the disadvantage that the surface finish is difficult to control with precision.

[009] It is an object of the present invention to provide an improved vehicle external mirror that overcomes some of the problems outlined above.

[010] SUMMARY OF THE INVENTION

[011] According to the a first aspect of present invention, there is provided a vehicle external mirror assembly comprising a head; a mount for attaching said head to a vehicle; and a mirror; said head comprising a molded thin external plastic shell; and a foam core, said foam anchoring and supporting said shell.

[012] Preferably the assembly further comprises a load diffuser extending laterally into said foam core from said mount, wherein, in use, loads acting on said head are transmitted through said foam to said load diffuser.

Preferably said head is pivotable with respect to said mount.

Preferably the stiffness of said diffuser reduces from adjacent said mount to its periphery.

[013] According to a second aspect of the present invention, there is provided a vehicle external mirror assembly comprising a head; a mount for attaching said head to a vehicle; and a mirror; said head comprising an external plastic shell; a foam core, said foam anchoring and supporting said shell; and a load diffuser extending laterally into said foam core from said mount, wherein, in use, loads acting on said head are transmitted through said foam to said load diffuser.

[014] Preferably said head is pivotable with respect to said mount.

[015] Preferably the stiffness of said diffuser reduces from adjacent said mount to its periphery.

[016] According to a third aspect of the present invention, there is provided a vehicle external mirror assembly comprising a head; a mount for attaching said head to a vehicle; and a mirror; said head comprising a front molded thin external plastic shell; a rear molded thin external plastic shell meeting said front shell at a joint; and a foam core, said foam anchoring and supporting said front and rear shells. The joint may be an overlapping joint or a butt joint

[017] According to a fourth aspect of the present invention, there is provided a vehicle external mirror assembly comprising a head; a mount for attaching said head to a vehicle; and a mirror; said head comprising a front thin external plastic shell; a rear thin external plastic shell and a foam core, the foam anchoring and supporting the shell.

[018] Preferably the assembly further comprises a porous foam gasket sandwiched between edges of said front and rear shells.

[019] According to a fifth aspect of the present invention, there is provided a method for manufacturing a vehicle external mirror housing, for housing a rear vision mirror, comprising the steps of molding a first thin plastic component for use as a front shell; molding a second thin plastic component for use as a rear shell; positioning and retaining said first and second shells against each other in an edge-to-edge relationship so as to create an internal void; and substantially filling said void with foam to form a rigid assembly bonded together by said foam.

[020] Preferably injection compression molding is used to mold both of said front and rear thin plastic components.

[021] Preferably the method comprises a sub-step of sandwiching a porous foam gasket between the edges of said first and second shells, whereby said gasket allows the escape of air but not foam from said void.

[022] According to a sixth aspect of the present invention, there is provided a method for manufacturing a vehicle external mirror housing, for mounting a rear vision mirror, comprising the steps of molding a pre-form component; blow molding said pre-form component into a component having the external shape of a said mirror housing; substantially filling said blow molded component with foam to form a rigid assembly.

[023] According to a seventh aspect of the present invention, there is provided a method for manufacturing a vehicle external mirror housing, for housing a rear vision mirror, comprising the steps of molding a first thin plastic component for use as a front shell; gas assist injection molding a second thin plastic component for use as a rear shell; positioning and retaining said first and second shells against each other in an edge-to-edge relationship so as to create an internal void; and substantially filling said void with foam to form a rigid assembly bonded together by said foam.

[024] Preferably injection compression molding is used to mold both of said front and rear thin plastic components.

[025] Specific embodiments of the invention will now be described in some further detail with reference to and as illustrated in the accompanying figures. These embodiments are illustrative, and are not meant to be restrictive of the scope of the invention.

[026] DETAILED DESCRIPTION OF THE DRAWINGS

[027] A preferred embodiment is illustrated in the accompanying representations in which:

[028] Fig. 1 shows a vehicle external side mirror assembly in an exploded view;

[029] Fig. 2 shows the mirror assembly of Fig. 1 in rear view;

[030] Fig. 3 shows the mirror assembly of Fig. 1 in side view;

[031] Fig. 4 shows a cross sectional view of the mirror assembly of Fig. 1 through the section lines 4-4 indicated in Fig. 3;

[032] Fig. 5 shows a cross sectional view of the mirror assembly of Fig. 1 through the section lines 5-5 indicated in Fig. 2;

[033] Fig. 6 shows a load diffuser for use with the assembly shown in Fig. 1;

[034] Fig. 7 shows an overlapping joint at the interface between the front and rear shells of the mirror housing shown in Figs. 1-5;

[035] Fig. 8 shows a butt joint at the interface between the front and rear shells of the mirror housing shown in Figs. 1-5. A hidden internal spill chamber is also shown;

[036] Fig. 9 shows a butt joint sandwiching a porous foam gasket at the interface between the front and rear shells of the mirror housing shown in Figs. 1-5; and

[037] Figs. 11-13 show an interdigitited joint at the interface between the front and rear shells of the mirror housing shown in Figs. 1-5.

[038] DETAILED DESCRIPTION OF THE INVENTION

[039] Referring to Fig. 1, a vehicle external side mirror assembly is shown in an exploded perspective view. This mirror assembly comprises three main parts: a mount for attachment to a vehicle in the form of a vehicle-to-mirror assembly attachment bracket 15, a mirror head 20 (shown assembled in Fig. 2) and a mirror 41. Mirror 41 is mounted on a mirror surround 40 which is connected to a motor mechanism assembly 25. The motor mechanism 25 provides a means for adjusting the orientation of the mirror 41 in relation to the housing 20.

[040] The mount/bracket 15 and mirror head 20 shown in Figs. 1 and 2 are separate components allowing a breakaway pivot assembly to be used. In some applications where breakaway is not required mount 15 may form an integral part of mirror head 20.

[041] Referring to the cross sectional representations of Figs. 4 and 5, the construction of the housing is apparent. Fig. 5 shows a front molded thin external plastic shell 50 and a rear molded thin external plastic shell 60 encapsulating a

polyurethane foam core 21. The foam 21 is injected into the external plastic shell halves 50 and 60 and, when cured, bonds to the internal surfaces of shell halves 50 and 60 to secure and support them.

[042] Fig. 4, showing a cross sectional view of the mirror assembly 10 through the section lines 4-4 shown on Fig. 3, reveals a load diffuser 45. This load diffuser extends laterally into the foam core from a pivot attachment region. In use, when loads and other loads acting on the mirror housing 20 are transmitted through the foam to the load diffuser 45 and to the pivot assembly 30. The load diffuser 45 distributes forces through the foam structure thereby reducing the maximum tensile and compressive stresses within the foam 21.

[043] The vehicle external mirror assembly 10 shown in Figs. 1 to 5 differs from conventional mirrors in that foam 25 and 18 is used to provide a rigid structure and to adhere the various components together. This design enables the shells of both the vehicle bracket 15 and the mirror housing 20 to be considerably thinner. Conventional mirror shells are normally between 2 and 3 millimeters thick. In the embodiment shown in Figs. 1 to 4 the wall thickness of the shells is approximately 0.7 millimeters. Because the wall thickness is reduced, the amount of plastics material used to produce an external mirror assembly is significantly reduced. Not only does this reduce the cost, it also reduces the weight of the mirror assembly.

[044] The foam 18 and 25 used to fill the shells 17, 50 and 60 has adhesive properties which bond to the shells and thereby anchor them in position. The bonding property of the foam obviates the need for bosses and connectors between separate components.

[045] Bonding of the foam to shells and other components can be improved by providing a rough surface finish on their internal faces. This can be achieved for instance by using a mold with a grained or matt finish.

[046] Fig. 5 shows the joint between the edge 51 of the front shell 50 and the edge 61 of the rear shell 60. Figs. 7 to 13 show details of various joints that may be used between these edges 51 and 61.

[047] Fig. 7 shows an overlapping joint detail. The overlapping joint is formed from a projection 62 which extends from the edge 51 of the front shell 50 into a

groove 52 within the edge 61 of the rear shell 60. This joint provides positive alignment of the front shell 50 to the rear shell 60 and also presents a long leakage path to foam 21. In practice this long path has been found to be sufficient to prevent any leakage of the foam 21 from inside the void created by front shell 50 and rear shell 60 to the external surface of the shells.

[048] Fig. 8 shows an alternative jointing arrangement in which a butt joint is used. A double edge 51 abuts an edge 61 thereby forming a hidden internal chamber 57. This hidden internal chamber 57 prevents the foam 21 escaping to the exterior of the front and rear shells 50 and 60. In practice, a small amount of foam 21' will escape into the hidden internal chamber 21 but will not progress out through the joint to the exterior surface of the shells.

[049] Figs. 10, 11, 12 and 13 show a further alternative in the form of an interdigitated joint. This joint produces a "clean" joint line on the exterior while providing a very strong and positively located joint between the front shell 50 and the rear shell 60.

[050] Fig. 9 shows a fourth alternative jointing detail in which a foam gasket 70 is used between the edge 61 of the rear shell and the edge 51 of the front shell. The "sandwich" foam gasket 70 performs the function during manufacture of allowing air to escape from the void formed between the front shell 50 and the rear shell 60 while at the same time preventing foam escaping.

[051] In the above described embodiment, both the vehicle-to-mirror assembly attachment bracket 15 and the mirror housing 20 are constructed from a molded thin shell anchored (secured) and supported by foam. In alternative embodiments, the bracket 15 may be constructed in the conventional way (no foam fill).

[052] A separate colored scalp 55 as shown in Fig. 1 may be produced to fit in an aperture 54 within the front shell 50. The foam 21 acts to bond the scalp 55 securely in place. Alternatively a recess 53 may be provided in front shell 50 to accommodate a scalp which may be glued or clipped in place (refer Fig. 5). Where a detachable clip on scalp is required, access holes may be provided through the foam 21 to the rear of the mirror housing 20 (not shown).

[053] While various plastics materials may be used to produce shell components 17, 50 and 60, ABS, ASA and polycarbonate have been found to be effective. The thickness of the plastics material can also be varied. Reduced thickness shells improves cycle times for the injection molding process and, because the foam 18 and 25 provides structural support for the mirror assembly, the rigidity and strength of the shell is of less importance. Depending on the plastic being used the thin shell will be less than 1.5 millimeters thick and usually in the range of 0.5 to 1 millimeter thick.

[054] Various foams 18 and 21 may be used to fill the hollow shells 17, 50 and 60. Polyurethane foams are one example. The foam density, rigidity and strength properties can be varied by changing the proportion of resin and other ingredients and by selection of pressures and curing times.

[055] Although not shown in Figs. 1 to 5, a film laminate can cover the front shell 50. This film laminate provides an aesthetically pleasing and abrasion resistant finish to the mirror housing. By including a colored film in the film laminate, the need for painting the mirror housing is eliminated. An abrasion resistant clear film covers the colored film and forms the final external layer.

[056] The vehicle external mirror assembly described above and depicted in Figs. 1 to 5 is lightweight, rigid and of adequate strength. However the structure is not capable of withstanding high point loads and therefore it is necessary to ensure that the interface between pivot assembly 30 and on one side vehicle bracket 15 and on the other side mirror housing 20 is such that loads are diffused through the foam 18 and 21. Load transmitting members 16 and 45 perform this function. They extend away from pivot assembly 30 deep into the foam thereby distributing forces through the foam 18 and 21 respectively and reducing the maximum tensile and compressive stresses within the vehicle bracket 15 and external mirror housing 20.

[057] The load transmitting members 16 and 45 can be designed so that their stiffness progressively reduces away from their connection points to the pivot assembly 30. This allows loads to be transferred from the relatively flexible foams 18 and 25 to the relatively rigid pivot assembly 30 while minimizing tensile

and compressive stresses. The large surface area of load transmitting members 19 and 45 assist in ensuring a strong bond to foams 18 and 25.

[058] A first method for manufacturing a vehicle external mirror housing, for mounting a rear vision mirror, will now be described. Firstly, two thin plastic components for use as front and rear shells are injection compression molded. Secondly, these two shells are positioned and retained against each other in an edge-to-edge relationship so as to create an internal void. Finally the aforesaid void is substantially filled with foam to form a rigid assembly bonded together by the foam. Optionally a porous foam gasket, such as the gasket 70 shown in Fig. 9, can be sandwiched between the edges of the shells before the foam is injected. Such a gasket allows the escape of air but not foam from the assembly.

[059] Where load diffusers are to be used, they are placed between the two thin plastic shells before the foam is injected.

[060] It has also been found effective to create an aperture within the rear shell 60 and to then place a motor mechanism assembly component 25 within the aperture before injecting the foam (refer Fig. 1). When the foam is injected it also bonds the motor mechanism assembly 25 in position.

[061] An alternative method for manufacturing a vehicle external mirror housing, for mounting a rear vision mirror, comprises the following steps. Firstly a pre-form component is injection molded. Secondly the component is blow molded into a component having the external shape of the mirror housing. Finally the blow molded component is filled with foam to form a rigid assembly.

[062] A further method for manufacturing a vehicle external mirror housing, for mounting a rear vision mirror, introduces gas assist injection molding techniques. In this method, a first thin plastic component for use as a front shell is injection compression molded and a second thin plastic component for use as a rear shell is injection molded using gas assistance. The gas assistance produces hollow voids within the component and speeds the cooling time for the component. Having injection molded the first and second components, they are positioned against each other in an edge-to-edge relationship so as to create an internal void.

This void is then substantially filled with foam to form a rigid assembly bonded together by the foam.

[063] While the present invention has been described in terms of preferred embodiments in order to facilitate better understanding of the invention, it should be appreciated that various modifications can be made without departing from the principles of the invention. Therefore, the invention should be understood to include all such modifications within its scope.

[001] VEHICLE EXTERNAL MIRROR ASSEMBLY AND
METHOD OF MANUFACTURE

[002] **FIELD OF THE INVENTION**

The present invention relates to vehicle mirror housings and in particular to vehicle external mirror housings formed from plastic.

[003] **BACKGROUND OF THE INVENTION**

[004] Vehicle external mirror housings have evolved from simple mounting structures for "wing mirrors" to receptacles for mirrors performing many functions and housing a number of components. For instance, mirror housings commonly house servomotors which are capable of rotating mirrors mounted to the housings about two axes so as to enable the driver to adjust his or her field of rear view. Also external mirror housings commonly are pivotable inward towards the vehicle side in the event of a collision with a solid object and, in some circumstances, automatically upon parking the vehicle to reduce the protrusions from the vehicle's side and its maximum width. Furthermore, equipment such as heaters, antennas and lights may also be supported by the modern external mirror housing. External mirror housings must also be shaped so as to minimize wind noise and so as to minimize drag, while providing an aesthetically pleasing external appearance. As a result, mirror housings have become larger, heavier, more complex and therefore more expensive to produce.

[005] To achieve the functionality and performance required at a reasonable cost, vehicle external mirror housings are usually produced in plastic using injection moulding techniques. Typically housings are made from shells of injection moulded plastics having wall thickness in the range of 2 to 3 millimetres/millimeters. Such a wall thickness has been found to provide adequate strength and rigidity.

[006] Many different mirror housing constructions are known. Mirror housings may be formed by two mating structural components, by one cosmetic component and one structural component, or from a single cosmetic/structural component. However generally, mirror housings are produced from at least two mating

components, which, when joined, form a hollow shell. Mating bosses, moulded into the shells are usually provided to facilitate alignment and joining of components. Within the hollow shell is provided a mount to enable connection of the mirror housing to a vehicle bracket, which itself is attached to the side of a vehicle. In order to avoid high stresses within the plastic shell, these mounts must be designed so that they distribute load away from the mount itself. This becomes increasingly important as the wall thickness of the plastics shell is reduced.

[007] Vehicle external mirror housings are generally made from shells having mounting and connection bosses which add to the complexity of the injection moulding tooling. Furthermore, the injection moulded shells, having a wall thickness of 2 to 3 ~~millimetres~~millimeters take a significant time to cool resulting in a cycle time of about 50 seconds. A reduction in wall thickness not only reduces cycle times but also reduces the amount of plastics material used, reduces the cost and reduces the weight of the mirror housing.

[008] An alternative external vehicle mirror construction for large mirrors such as those found on trucks and buses is disclosed by Canadian Patent Application No. 2198267. With this construction, a core is moulded from polyurethane foam and subsequently a reinforcing layer "a few ~~millimetres~~millimeters thick" is sprayed on. While this construction may have some advantages for large mirrors, it has the disadvantage that the surface finish is difficult to control with precision.

[009] It is an object of the present invention to provide an improved vehicle external mirror that overcomes some of the problems outlined above.

[010] SUMMARY OF THE INVENTION

[011] According to the a first aspect of present invention, there is provided a vehicle external mirror assembly comprising: — a head; — a mount for attaching said head to a vehicle; and — a mirror; — said head comprising: a moulded thin external plastic shell; and — a foam core, said foam anchoring and supporting said shell.

[012] Preferably the assembly further comprises a load diffuser extending laterally into said foam core from said mount, ——wherein, in use, loads acting on said head are transmitted through said foam to said load diffuser.

Preferably said head is pivotable with respect to said mount.

Preferably the stiffness of said diffuser reduces from adjacent said mount

to its periphery.

[013] According to a second aspect of the present invention, there is provided a vehicle external mirror assembly comprising a head; a mount for attaching said head to a vehicle; and a mirror; said head comprising an external plastic shell; a foam core, said foam anchoring and supporting said shell; and a load diffuser extending laterally into said foam core from said mount, wherein, in use, loads acting on said head are transmitted through said foam to said load diffuser.

[014] Preferably said head is pivotable with respect to said mount.

[015] Preferably the stiffness of said diffuser reduces from adjacent said mount to its periphery.

[016] According to a 2ndthird aspect of the present invention, there is provided a vehicle external mirror assembly comprising: — a head; — a mount for attaching said head to a vehicle; and — a mirror; — said head comprising: a front moulded thin external plastic shell; — a rear moulded thin external plastic shell meeting said front shell in at an edge-to-edge relationship with an overlapping joint; and — a foam core, said foam anchoring and supporting said front and rear shells.

[014] Preferably the The joint may be an overlapping joint is formed from a projection, extending from the edge of one of the front or rear shells, received within a groove within the edge of the other of said front or rear shells.

[015] Preferably the assembly further comprises a load diffuser extending laterally into said foam core from said mount, — wherein, in use, loads acting on said head are transmitted through said foam to said load diffuser.

[016] or a butt joint

[017] According to a 3rd~~fourth~~ aspect of the present invention, there is provided a vehicle external mirror assembly comprising: — a head; — a mount for attaching said head to a vehicle; and — a mirror; — said head comprising: a front moulded thin external plastic shell; — a rear moulded thin external plastic shell ~~meeting said front shell in an edge to edge relationship with a butt joint; and — a foam core, said foam anchoring and supporting said front and rear shells.~~

[017] Preferably the assembly further comprises a hidden internal chamber formed between edges of said front and rear shells for preventing foam escaping to the exterior of said shells.

[018] According to a 4th aspect of the present invention, there is provided a vehicle external mirror assembly comprising: — a head; — a mount for attaching said head to a vehicle; and — a mirror; — said head comprising: — a front moulded thin external plastic shell; — a rear moulded thin external plastic shell; — a porous foam gasket sandwiched between edges of the front and rear shell; and — and a foam core, the foam anchoring and supporting the shell.

[018] Preferably the assembly further comprises a load diffuser extending laterally into said foam core from said mount, wherein, in use, loads acting on said head are transmitted through said foam to said load diffuser.

[020] porous foam gasket sandwiched between edges of said front and rear shells.

[019] According to a 5th~~fifth~~ aspect of the present invention, there is provided a method for manufacturing a vehicle external mirror housing, for ~~mounting~~housing a rear vision mirror, comprising the steps of: — moulding a first thin plastic component for use as a front shell; — moulding a second thin plastic component for use as a rear shell; — positioning and retaining ~~the~~said first and second shells against each other in an edge-to-edge relationship so as to create an internal void; and — substantially filling ~~the~~said void with foam to form a rigid assembly bonded together by ~~the~~ foam:

[021] said foam.

[020] Preferably injection compression molding is used to mold both of said front and rear thin plastic components.

[021] Preferably the method comprises a sub-step of sandwiching a porous foam gasket between the edges of said first and second shells, whereby said gasket allows the escape of air but not foam from said void.

[022] According to a 6thsixth aspect of the present invention, there is provided a method for manufacturing a vehicle external mirror housing, for mounting a rear vision mirror, comprising the steps of: —moulding a pre-form component; blow moulding thesaid pre-form component into a component having the external shape of a thesaid mirror housing; ——substantially filling thesaid blow moulded component with foam to form a rigid assembly.

[023] According to a 7thseventh aspect of the present invention, there is provided a method for manufacturing a vehicle external mirror housing, for mountinghousing a rear vision mirror, comprising the steps of: —moulding a first thin plastic component for use as a front shell; —gas assist injection moulding a second thin plastic component for use as a rear shell; ——positioning and retaining thesaid first and second shells against each other in an edge-to-edge relationship so as to create an internal void; and ——substantially filling thesaid void with foam to form a rigid assembly bonded together by the foam.

[023] said foam.

[024] Preferably injection compression molding is used to mold both of said front and rear thin plastic components.

[025] Specific embodiments of the invention will now be described in some further detail with reference to and as illustrated in the accompanying figures. These embodiments are illustrative, and are not meant to be restrictive of the scope of the invention.

[026] DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION DRAWINGS

[027] A preferred embodiment is illustrated in the accompanying representations in which:

[028] Fig 1 shows a vehicle external side mirror assembly in an exploded view;:

[029] Fig 2 shows the mirror assembly of Fig 1 in rear view;:

[030] Fig 3 shows the mirror assembly of Fig 1 in side view;:

[031] Fig 4 shows a cross sectional view of the mirror assembly of Fig 1 through the section lines 4-4 indicated in Fig 3;:

[032] Fig 5 shows a cross sectional view of the mirror assembly of Fig 1 through the section lines 5-5 indicated in Fig 2;:

[033] Fig 6 shows a load diffuser for use with the assembly shown in Fig 1;:

[034] Fig 7 shows an overlapping joint at the interface between the front and rear shells of the mirror housing shown in Figs 1-5;:

[035] Fig 8 shows a butt joint at the interface between the front and rear shells of the mirror housing shown in Figs 1-5. A hidden internal spill chamber is also shown;:

[036] Fig 9 shows a butt joint sandwiching a porous foam gasket at the interface between the front and rear shells of the mirror housing shown in Figs 1-5.; and

[037] Figs 11-13 show an interdigitated joint at the interface between the front and rear shells of the mirror housing shown in Figs 1-5.

[038] DETAILED DESCRIPTION OF THE INVENTION

[039] Referring to Fig 1, a vehicle external side mirror assembly is shown in an exploded perspective view. This mirror assembly comprises three main parts: a mount for attachment to a vehicle in the form of a vehicle-to-mirror assembly attachment bracket 15, a mirror head 20 (shown assembled in Fig 2) and a mirror 41. Mirror 41 is mounted on a mirror surround 40 which is connected to a motor mechanism assembly 25. The motor mechanism 25 provides a means for adjusting the orientation of the mirror 41 in relation to the housing 20.

[040] The mount/bracket 15 and mirror head 20 shown in Figs 1 and 2 are separate components allowing a breakaway pivot assembly to be used. In some

applications where breakaway is not required mount 15 may form an integral part of mirror head 20.

[041] Referring to the cross sectional representations of Figs 4 and 5, the construction of the housing is apparent. Fig 5 shows a front moulded thin external plastic shell 50 and a rear moulded thin external plastic shell 60 encapsulating a polyurethane foam core 21. The foam 21 is injected into the external plastic shell halves 50 and 60 and, when cured, bonds to the internal surfaces of shell halves 50 and 60 to secure and support them.

[042] Fig 4, showing a cross sectional view of the mirror assembly 10 through the section lines 4-4 shown on Fig 3, reveals a load diffuser 45. This load diffuser extends laterally into the foam core from a pivot attachment region. In use, when loads and other loads acting on the mirror housing 20 are transmitted through the foam to the load diffuser 45 and to the pivot assembly 30. The load diffuser 45 distributes forces through the foam structure thereby reducing the maximum tensile and compressive stresses within the foam 21.

[043] The vehicle external mirror assembly 10 shown in Figs 1 to 5 differs from conventional mirrors in that foam 25 and 18 is used to provide a rigid structure and to adhere the various components together. This design enables the shells of both the vehicle bracket 15 and the mirror housing 20 to be considerably thinner. Conventional mirror shells are normally between 2 and 3 ~~millimetres~~millimeters thick. In the embodiment shown in Figs 1 to 4 the wall thickness of the shells is approximately 0.7 ~~millimetres~~millimeters. Because the wall thickness is reduced, the amount of plastics material used to produce an external mirror assembly is significantly reduced. Not only does this reduce the cost, it also reduces the weight of the mirror assembly.-

[044] The foam 18 and 25 used to fill the shells 17, 50 and 60 has adhesive properties which bond to the shells and thereby anchor them in position. The bonding property of the foam obviates the need for bosses and connectors between separate components..

[045] Bonding of the foam to shells and other components can be improved by providing a rough surface finish on their internal faces. This can be achieved for instance by using a mould with a grained or matt finish..

[046] Fig 5 shows the joint between the edge 51 of the front shell 50 and the edge 61 of the rear shell 60. Figs 7 to 13 show details of various joints that may be used between these edges 51 and 61..

[047] Fig 7 shows an overlapping joint detail. The overlapping joint is formed from a projection 62 which extends from the edge 51 of the front shell 50 into a groove 52 within the edge 61 of the rear shell 60. This joint provides positive alignment of the front shell 50 to the rear shell 60 and also presents a long leakage path to foam 21. In practice this long path has been found to be sufficient to prevent any leakage of the foam 21 from inside the void created by front shell 50 and rear shell 60 to the external surface of the shells..

[048] Fig 8 shows an alternative jointing arrangement in which a butt joint is used. A double edge 51 abuts an edge 61 thereby forming a hidden internal chamber 57. This hidden internal chamber 57 prevents the foam 21 escaping to the exterior of the front and rear shells 50 and 60. In practice, a small amount of foam 21 will escape into the hidden internal chamber 21 but will not progress out through the joint to the exterior surface of the shells..

[049] Figs 10, 11, 12 and 13 show a further alternative in the form of an interdigitated joint. This joint produces a "clean" joint line on the exterior while providing a very strong and positively located joint between the front shell 50 and the rear shell 60..

[050] Fig 9 shows a fourth alternative jointing detail in which a foam gasket 70 is used between the edge 61 of the rear shell and the edge 51 of the front shell. The "sandwich" foam gasket 70 performs the function during manufacture of allowing air to escape from the void formed between the front shell 50 and the rear shell 60 while at the same time preventing foam escaping..

[051] In the above described embodiment, both the vehicle-to-mirror assembly attachment bracket 15 and the mirror housing 20 are constructed from a moulded

thin shell anchored (secured) and supported by foam._ In alternative embodiments, the bracket 15 may be constructed in the conventional way (no foam fill)._

[052] A separate coloured scalp 55 as shown in Fig 1 may be produced to fit in an aperture 54 within the front shell 50. _The foam 21 acts to bond the scalp 55 securely in place._ Alternatively a recess 53 may be provided in front shell 50 to accommodate a scalp which may be glued or clipped in place (refer Fig 5)._ Where a detachable clip on scalp is required, access holes may be provided through the foam 21 to the rear of the mirror housing 20 (not shown)._

[053] While various plastics materials may be used to produce shell components 17, 50 and 60, ABS, ASA and polycarbonate have been found to be effective. _The thickness of the plastics material can also be varied._ Reduced thickness shells improves cycle times for the injection moulding process and, because the foam 18 and 25 provides structural support for the mirror assembly, the rigidity and strength of the shell is of less importance. _Depending on the plastic being used the thin shell will be less than 1.5 millimetresmillimeters thick and usually in the range of 0..5 to 1 millimetremillimeter thick..

[054] Various foams 18 and 21 may be used to fill the hollow shells 17, 50 and 60. _Polyurethane foams are one example._ The foam density, rigidity and strength properties can be varied by changing the proportion of resin and other ingredients and by selection of pressures and curing times._

[055] Although not shown in Figs 1 to 5, a film laminate can cover the front shell 50._ This film laminate provides an aesthetically pleasing and abrasion resistant finish to the mirror housing. _By including a coloured film in the film laminate, the need for painting the mirror housing is eliminated. _An abrasion resistant clear film covers the coloured film and forms the final external layer._

[056] The vehicle external mirror assembly described above and depicted in Figs 1 to 5 is lightweight, rigid and of adequate strength._ However the structure is not capable of withstanding high point loads and therefore it is necessary to ensure that the interface between pivot assembly 30 and on one side vehicle bracket 15 and on the other side mirror housing 20 is such that loads are diffused through the foam 18 and 21. _Load transmitting members 16 and 45 perform this

function._ They extend away from pivot assembly 30 deep into the foam thereby distributing forces through the foam 18 and 21 respectively and reducing the maximum tensile and compressive stresses within the vehicle bracket 15 and external mirror housing 20._

[057] The load transmitting members 16 and 45 can be designed so that their stiffness progressively reduces away from their connection points to the pivot assembly 30. _This allows loads to be transferred from the relatively flexible foams 18 and 25 to the relatively rigid pivot assembly 30 while minimising tensile and compressive stresses._ The large surface area of load transmitting members 19 and 45 assist in ensuring a strong bond to foams 18 and 25._

[058] A first method for manufacturing a vehicle external mirror housing, for mounting a rear vision mirror, will now be described. _Firstly, two thin plastic components for use as front and rear shells are injection compression moulded. Secondly, these two shells are positioned and retained against each other in an edge-to-edge relationship so as to create an internal void. _Finally the aforesaid void is substantially filled with foam to form a rigid assembly bonded together by the foam. _Optionally a porous foam gasket, such as the gasket 70 shown in Fig 9, can be sandwiched between the edges of the shells before the foam is injected. _Such a gasket allows the escape of air but not foam from the assembly._

[059] Where load diffusers are to be used, they are placed between the two thin plastic shells before the foam is injected._

[060] It has also been found effective to create an aperture within the rear shell 60 and to then place a motor mechanism assembly component 25 within the aperture before injecting the foam (refer Fig 1). _When the foam is injected it also bonds the motor mechanism assembly 25 in position._

[061] An alternative method for manufacturing a vehicle external mirror housing, for mounting a rear vision mirror, comprises the following steps. _Firstly a pre-form component is injection moulded._ Secondly the component is blow moulded into a component having the external shape of the mirror housing. _Finally the blow moulded component is filled with foam to form a rigid assembly._

[062] A further method for manufacturing a vehicle external mirror housing, for mounting a rear vision mirror, introduces gas assist injection moulding techniques. In this method, a first thin plastic component for use as a front shell is injection compression moulded and a second thin plastic component for use as a rear shell is injection moulded using gas assistance. The gas assistance produces hollow voids within the component and speeds the cooling time for the component. Having injection moulded the first and second components, they are positioned against each other in an edge-to-edge relationship so as to create an internal void. This void is then substantially filled with foam to form a rigid assembly bonded together by the foam.

[063] While the present invention has been described in terms of preferred embodiments in order to facilitate better understanding of the invention, it should be appreciated that various modifications can be made without departing from the principles of the invention. Therefore, the invention should be understood to include all such modifications within its scope.

VEHICLE EXTERNAL MIRROR ASSEMBLY AND METHOD OF MANUFACTURE

The present invention relates to vehicle mirror housings and in particular to vehicle external mirror housings formed from plastic.

BACKGROUND

Vehicle external mirror housings have evolved from simple mounting structures for "wing mirrors" to receptacles for mirrors performing many functions and housing a number of components. For instance, mirror housings commonly house servomotors which are capable of rotating mirrors mounted to the housings about two axes so as to enable the driver to adjust his or her field of rear view. Also external mirror housings commonly are pivotable inward towards the vehicle side in the event of a collision with a solid object and, in some circumstances, automatically upon parking the vehicle to reduce the protrusions from the vehicle's side and its maximum width. Furthermore, equipment such as heaters, antennas and lights may also be supported by the modern external mirror housing. External mirror housings must also be shaped so as to minimise wind noise and so as to minimise drag, while providing an aesthetically pleasing external appearance. As a result, mirror housings have become larger, heavier, more complex and therefore more expensive to produce.

To achieve the functionality and performance required at a reasonable cost, vehicle external mirror housings are usually produced in plastic using injection moulding techniques. Typically housings are made from shells of injection moulded plastics having wall thickness in the range of 2 to 3 millimetres. Such a wall thickness has been found to provide adequate strength and rigidity.

Many different mirror housing constructions are known. Mirror housings may be formed by two mating structural components, by one cosmetic component and one structural component, or from a single cosmetic/structural component.

However generally, mirror housings are produced from at least two mating components, which, when joined, form a hollow shell. Mating bosses, moulded into the shells are usually provided to facilitate alignment and joining of components. Within the hollow shell is provided a mount to enable connection of the mirror housing to a vehicle bracket, which itself is attached to the side of a vehicle. In order to avoid high stresses within the plastic shell, these mounts must be designed so that they distribute load away from the mount itself. This becomes increasingly important as the wall thickness of the plastics shell is reduced.

Vehicle external mirror housings are generally made from shells having mounting and connection bosses which add to the complexity of the injection moulding tooling. Furthermore, the injection moulded shells, having a wall thickness of 2 to 3 millimetres take a significant time to cool resulting in a cycle time of about 50 seconds. A reduction in wall thickness not only reduces cycle times but also reduces the amount of plastics material used, reduces the cost and reduces the weight of the mirror housing.

An alternative external vehicle mirror construction for large mirrors such as those found on trucks and buses is disclosed by Canadian Patent Application No. 2198267. With this construction, a core is moulded from polyurethane foam and subsequently a reinforcing layer "a few millimetres thick" is sprayed on. While this construction may have some advantages for large mirrors, it has the disadvantage that the surface finish is difficult to control with precision.

It is an object of the present invention to provide an improved vehicle external mirror that overcomes some of the problems outlined above.

SUMMARY OF THE INVENTION

According to the present invention, there is provided a vehicle external mirror assembly comprising:

a head;
a mount for attaching said head to a vehicle; and
a mirror;

said head comprising:
a moulded thin external plastic shell; and
a foam core, said foam anchoring and supporting said shell.

Preferably the assembly further comprises a load diffuser extending laterally into said foam core from said mount,

wherein, in use, loads acting on said head are transmitted through said foam to said load diffuser.

According to a 2nd aspect of the present invention, there is provided a vehicle external mirror assembly comprising:

a head;
a mount for attaching said head to a vehicle; and
a mirror;
said head comprising:
a front moulded thin external plastic shell;
a rear moulded thin external plastic shell meeting said front shell in an edge to edge relationship with an overlapping joint; and
a foam core, said foam anchoring and supporting said front and rear shells.

Preferably the overlapping joint is formed from a projection, extending from the edge of one of the front or rear shells, received within a groove within the edge of the other of said front or rear shells.

Preferably the assembly further comprises a load diffuser extending laterally into said foam core from said mount,

wherein, in use, loads acting on said head are transmitted through said foam to said load diffuser.

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According to a 3rd aspect of the present invention, there is provided a vehicle external mirror assembly comprising:

- a head;
- a mount for attaching said head to a vehicle; and
- a mirror;

said head comprising:

- a front moulded thin external plastic shell;
- a rear moulded thin external plastic shell meeting said front shell in an edge to edge relationship with a butt joint; and
- a foam core, said foam anchoring and supporting said front and rear shells.

Preferably the assembly further comprises a hidden internal chamber formed between edges of said front and rear shells for preventing foam escaping to the exterior of said shells.

According to a 4th aspect of the present invention, there is provided a vehicle external mirror assembly comprising:

- a head;
- a mount for attaching said head to a vehicle; and
- a mirror;

said head comprising:

- a front moulded thin external plastic shell;
- a rear moulded thin external plastic shell;
- a porous foam gasket sandwiched between edges of the front and rear shell;

and

- a foam core, the foam anchoring and supporting the shell.

Preferably the assembly further comprises a load diffuser extending laterally into said foam core from said mount,

wherein, in use, loads acting on said head are transmitted through said foam to said load diffuser.

According to a 5th aspect of the present invention, there is provided a method for manufacturing a vehicle external mirror housing, for mounting a rear vision mirror, comprising the steps of:

- moulding a first thin plastic component for use as a front shell;
- moulding a second thin plastic component for use as a rear shell;
- positioning and retaining the first and second shells against each other in an edge-to-edge relationship so as to create an internal void; and
- substantially filling the void with foam to form a rigid assembly bonded together by the foam.

According to a 6th aspect of the present invention, there is provided a method for manufacturing a vehicle external mirror housing, for mounting a rear vision mirror, comprising the steps of:

- moulding a pre-form component;
- blow moulding the pre-form component into a component having the external shape of a the mirror housing;
- substantially filling the blow moulded component with foam to form a rigid assembly.

According to a 7th aspect of the present invention, there is provided a method for manufacturing a vehicle external mirror housing, for mounting a rear vision mirror, comprising the steps of:

- moulding a first thin plastic component for use as a front shell;
- gas assist injection moulding a second thin plastic component for use as a rear shell;
- positioning and retaining the first and second shells against each other in an edge-to-edge relationship so as to create an internal void; and
- substantially filling the void with foam to form a rigid assembly bonded together by the foam.

Specific embodiments of the invention will now be described in some further detail with reference to and as illustrated in the accompanying figures. These embodiments are illustrative, and are not meant to be restrictive of the scope of the invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

A preferred embodiment is illustrated in the accompanying representations in which:

Fig 1 shows a vehicle external side mirror assembly in an exploded view.
Fig 2 shows the mirror assembly of Fig 1 in rear view.
Fig 3 shows the mirror assembly of Fig 1 in side view.
Fig 4 shows a cross sectional view of the mirror assembly of Fig 1 through the section lines 4-4 indicated in Fig 3.

Fig 5 shows a cross sectional view of the mirror assembly of Fig 1 through the section lines 5-5 indicated in Fig 2.

Fig 6 shows a load diffuser for use with the assembly shown in Fig 1.
Fig 7 shows an overlapping joint at the interface between the front and rear shells of the mirror housing shown in Figs 1-5.

Fig 8 shows a butt joint at the interface between the front and rear shells of the mirror housing shown in Figs 1-5. A hidden internal spill chamber is also shown.

Fig 9 shows a butt joint sandwiching a porous foam gasket at the interface between the front and rear shells of the mirror housing shown in Figs 1-5.

Figs 11-13 show an interdigitated joint at the interface between the front and rear shells of the mirror housing shown in Figs 1-5.

Referring to Fig 1, a vehicle external side mirror assembly is shown in an exploded perspective view. This mirror assembly comprises three main parts: a mount for attachment to a vehicle in the form of a vehicle-to-mirror assembly attachment bracket 15, a mirror head 20 (shown assembled in Fig 2) and a mirror 41. Mirror 41 is mounted on a mirror surround 40 which is connected to a motor

mechanism assembly 25. The motor mechanism 25 provides a means for adjusting the orientation of the mirror 41 in relation to the housing 20.

The mount/bracket 15 and mirror head 20 shown in Figs 1 and 2 are separate components allowing a breakaway pivot assembly to be used. In some applications where breakaway is not required mount 15 may form an integral part of mirror head 20.

Referring to the cross sectional representations of Figs 4 and 5, the construction of the housing is apparent. Fig 5 shows a front moulded thin external plastic shell 50 and a rear moulded thin external plastic shell 60 encapsulating a polyurethane foam core 21. The foam 21 is injected into the external plastic shell halves 50 and 60 and, when cured, bonds to the internal surfaces of shell halves 50 and 60 to secure and support them.

Fig 4, showing a cross sectional view of the mirror assembly 10 through the section lines 4-4 shown on Fig 3, reveals a load diffuser 45. This load diffuser extends laterally into the foam core from a pivot attachment region. In use, when loads and other loads acting on the mirror housing 20 are transmitted through the foam to the load diffuser 45 and to the pivot assembly 30. The load diffuser 45 distributes forces through the foam structure thereby reducing the maximum tensile and compressive stresses within the foam 21.

The vehicle external mirror assembly 10 shown in Figs 1 to 5 differs from conventional mirrors in that foam 25 and 18 is used to provide a rigid structure and to adhere the various components together. This design enables the shells of both the vehicle bracket 15 and the mirror housing 20 to be considerably thinner. Conventional mirror shells are normally between 2 and 3 millimetres thick. In the embodiment shown in Figs 1 to 4 the wall thickness of the shells is approximately 0.7 millimetres. Because the wall thickness is reduced, the amount of plastics material

used to produce an external mirror assembly is significantly reduced. Not only does this reduce the cost, it also reduces the weight of the mirror assembly.

The foam 18 and 25 used to fill the shells 17, 50 and 60 has adhesive properties which bond to the shells and thereby anchor them in position. The bonding property of the foam obviates the need for bosses and connectors between separate components.

Bonding of the foam to shells and other components can be improved by providing a rough surface finish on their internal faces. This can be achieved for instance by using a mould with a grained or matt finish.

Fig 5 shows the joint between the edge 51 of the front shell 50 and the edge 61 of the rear shell 60. Figs 7 to 13 show details of various joints that may be used between these edges 51 and 61.

Fig 7 shows an overlapping joint detail. The overlapping joint is formed from a projection 62 which extends from the edge 51 of the front shell 50 into a groove 52 within the edge 61 of the rear shell 60. This joint provides positive alignment of the front shell 50 to the rear shell 60 and also presents a long leakage path to foam 21. In practice this long path has been found to be sufficient to prevent any leakage of the foam 21 from inside the void created by front shell 50 and rear shell 60 to the external surface of the shells.

Fig 8 shows an alternative jointing arrangement in which a butt joint is used. A double edge 51 abuts an edge 61 thereby forming a hidden internal chamber 57. This hidden internal chamber 57 prevents the foam 21 escaping to the exterior of the front and rear shells 50 and 60. In practice, a small amount of foam 21' will escape into the hidden internal chamber 21 but will not progress out through the joint to the exterior surface of the shells.

Figs 10, 11, 12 and 13 show a further alternative in the form of an interdigitated joint. This joint produces a "clean" joint line on the exterior while providing a very strong and positively located joint between the front shell 50 and the rear shell 60.

Fig 9 shows a fourth alternative jointing detail in which a foam gasket 70 is used between the edge 61 of the rear shell and the edge 51 of the front shell. The "sandwich" foam gasket 70 performs the function during manufacture of allowing air to escape from the void formed between the front shell 50 and the rear shell 60 while at the same time preventing foam escaping.

In the above described embodiment, both the vehicle-to-mirror assembly attachment bracket 15 and the mirror housing 20 are constructed from a moulded thin shell anchored (secured) and supported by foam. In alternative embodiments, the bracket 15 may be constructed in the conventional way (no foam fill).

A separate coloured scalp 55 as shown in Fig 1 may be produced to fit in an aperture 54 within the front shell 50. The foam 21 acts to bond the scalp 55 securely in place. Alternatively a recess 53 may be provided in front shell 50 to accommodate a scalp which may be glued or clipped in place (refer Fig 5). Where a detachable clip on scalp is required, access holes may be provided through the foam 21 to the rear of the mirror housing 20 (not shown).

While various plastics materials may be used to produce shell components 17, 50 and 60, ABS, ASA and polycarbonate have been found to be effective. The thickness of the plastics material can also be varied. Reduced thickness shells improves cycle times for the injection moulding process and, because the foam 18 and 25 provides structural support for the mirror assembly, the rigidity and strength of the shell is of less importance. Depending on the plastic being used the thin shell will be less than 1.5 millimetres thick and usually in the range of 0.5 to 1 millimetre thick.

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Various foams 18 and 21 may be used to fill the hollow shells 17, 50 and 60. Polyurethane foams are one example. The foam density, rigidity and strength properties can be varied by changing the proportion of resin and other ingredients and by selection of pressures and curing times.

Although not shown in Figs 1 to 5, a film laminate can cover the front shell 50. This film laminate provides an aesthetically pleasing and abrasion resistant finish to the mirror housing. By including a coloured film in the film laminate, the need for painting the mirror housing is eliminated. An abrasion resistant clear film covers the coloured film and forms the final external layer.

The vehicle external mirror assembly described above and depicted in Figs 1 to 5 is lightweight, rigid and of adequate strength. However the structure is not capable of withstanding high point loads and therefore it is necessary to ensure that the interface between pivot assembly 30 and on one side vehicle bracket 15 and on the other side mirror housing 20 is such that loads are diffused through the foam 18 and 21. Load transmitting members 16 and 45 perform this function. They extend away from pivot assembly 30 deep into the foam thereby distributing forces through the foam 18 and 21 respectively and reducing the maximum tensile and compressive stresses within the vehicle bracket 15 and external mirror housing 20.

The load transmitting members 16 and 45 can be designed so that their stiffness progressively reduces away from their connection points to the pivot assembly 30. This allows loads to be transferred from the relatively flexible foams 18 and 25 to the relatively rigid pivot assembly 30 while minimising tensile and compressive stresses. The large surface area of load transmitting members 19 and 45 assist in ensuring a strong bond to foams 18 and 25.

A first method for manufacturing a vehicle external mirror housing, for mounting a rear vision mirror, will now be described. Firstly, two thin plastic components for use as a front and rear shells are injection compression moulded.

Secondly, these two shells are positioned and retained against each other in an edge-to-edge relationship so as to create an internal void. Finally the aforesaid void is substantially filled with foam to form a rigid assembly bonded together by the foam. Optionally a porous foam gasket, such as the gasket 70 shown in Fig 9, can be sandwiched between the edges of the shells before the foam is injected. Such a gasket allows the escape of air but not foam from the assembly.

Where load diffusers are to be used, they are placed between the two thin plastic shells before the foam is injected.

It has also been found effective to create an aperture within the rear shell 60 and to then place a motor mechanism assembly component 25 within the aperture before injecting the foam (refer Fig 1). When the foam is injected it also bonds the motor mechanism assembly 25 in position.

An alternative method for manufacturing a vehicle external mirror housing, for mounting a rear vision mirror, comprises the following steps. Firstly a pre-form component is injection moulded. Secondly the component is blow moulded into a component having the external shape of the mirror housing. Finally the blow moulded component is filled with foam to form a rigid assembly.

A further method for manufacturing a vehicle external mirror housing, for mounting a rear vision mirror, introduces gas assist injection moulding techniques. In this method, a first thin plastic component for use as a front shell is injection compression moulded and a second thin plastic component for use as a rear shell is injection moulded using gas assistance. The gas assistance produces hollow voids within the component and speeds the cooling time for the component. Having injection moulded the first and second components, they are positioned against each other in an edge-to-edge relationship so as to create an internal void. This void is then substantially filled with foam to form a rigid assembly bonded together by the foam.

While the present invention has been described in terms of preferred embodiments in order to facilitate better understanding of the invention, it should be appreciated that various modifications can be made without departing from the principles of the invention. Therefore, the invention should be understood to include all such modifications within its scope.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A vehicle external mirror assembly comprising:
 - a head;
 - a mount for attaching said head to a vehicle; and
 - a mirror;

said head comprising:

 - a moulded thin external plastic shell; and
 - a foam core, said foam anchoring and supporting said shell.
2. A vehicle external mirror assembly according to claim 1 further comprising a load diffuser extending laterally into said foam core from said mount,

wherein, in use, loads acting on said head are transmitted through said foam to said load diffuser.
3. A vehicle external mirror assembly according to claim 2 wherein said head is pivotable with respect to said mount.
4. A vehicle external mirror assembly according to claim 3 wherein the interior surface of both said front and rear shells are rough to improve adhesion to said foam.
5. A vehicle external mirror assembly according to claim 3 where said mount has a pivot assembly receiving portion, a vehicle body abutment and connection portion, and a body, said body comprising:
 - a moulded thin external plastic body shell; and
 - a second foam core, said second foam anchoring and supporting said body shell.
6. A vehicle external mirror assembly according to any one of claims 2, 3, 4 or 5 wherein the stiffness of said diffuser reduces from adjacent said mount to its periphery.

7. A vehicle external mirror assembly comprising:

- a head;
- a mount for attaching said head to a vehicle; and
- a mirror;

said head comprising:

- a front moulded thin external plastic shell;
- a rear moulded thin external plastic shell meeting said front shell in an edge to edge relationship with an overlapping joint; and
- a foam core, said foam anchoring and supporting said front and rear shells.

8. A vehicle external mirror assembly according to claim 7 wherein said overlapping joint is formed from a projection, extending from the edge of one of the front or rear shells, received within a groove within the edge of the other of said front or rear shells.

9. A vehicle external mirror assembly according to claim 8 further comprising a load diffuser extending laterally into said foam core from said mount,
wherein, in use, loads acting on said head are transmitted through said foam to said load diffuser.

10. A vehicle external mirror assembly according to claim 9 wherein said head is pivotable with respect to said mount.

11. A vehicle external mirror assembly according to claim 10 wherein the interior surface of both said front and rear shells are rough to improve adhesion to said foam.

12. A vehicle external mirror assembly according to claim 10 where said mount has a pivot assembly receiving portion, a vehicle body abutment and connection portion, and a body, said body comprising:

- a moulded thin external plastic body shell; and

a second foam core, said second foam anchoring and supporting said body shell.

13. A vehicle external mirror assembly according to any one of claims 8, 9, 10, 11 or 12 wherein the stiffness of said diffuser reduces from adjacent said mount to its periphery.

14. A vehicle external mirror assembly comprising:

a head;

a mount for attaching said head to a vehicle; and

a mirror;

said head comprising:

a front moulded thin external plastic shell;

a rear moulded thin external plastic shell meeting said front shell in an edge to edge relationship with a butt joint; and

a foam core, said foam anchoring and supporting said front and rear shells.

15. A vehicle external mirror assembly according to claim 14 further comprising a hidden internal chamber formed between edges of said front and rear shells for preventing foam escaping to the exterior of said shells.

16. A vehicle external mirror assembly according to claim 15 wherein at least one of said front and rear shells terminates in parallel double edges to provide a double butt joint against the other of said front and rear shells, thereby forming said hidden internal chamber.

17. A vehicle external mirror assembly according to claim 16 further comprising a load diffuser extending laterally into said foam core from said mount,
wherein, in use, loads acting on said head are transmitted through said foam to said load diffuser.

18. A vehicle external mirror assembly according to claim 17 wherein said housing is pivotable with respect to said mount.

19. A vehicle external mirror assembly according to claim 18 wherein the interior surface of both said front and rear shells are rough to improve adhesion to said foam.

20. A vehicle external mirror assembly according to claim 18 where said mount has a pivot assembly receiving portion, a vehicle body abutment and connection portion, and a body, said body comprising:

- a moulded thin external plastic body shell; and
- a second foam core, said second foam anchoring and supporting said body shell.

21. A vehicle external mirror assembly according to any one of claims 14, 15, 16, 17, 18, 19 or 20 wherein the stiffness of said diffuser reduces from adjacent said mount to its periphery.

22. A vehicle external mirror assembly comprising:

- a head;
- a mount for attaching said head to a vehicle; and
- a mirror;

said head comprising:

- a front moulded thin external plastic shell;
- a rear moulded thin external plastic shell;
- a porous foam gasket sandwiched between edges of the front and rear shell;

and

- a foam core, the foam anchoring and supporting the shell.

23. A vehicle external mirror assembly according to claim 22 further comprising a load diffuser extending laterally into said foam core from said mount,

wherein, in use, loads acting on said head are transmitted through said foam to said load diffuser.

24. A vehicle external mirror assembly according to claim 23 wherein said housing is pivotable with respect to said mount.
25. A vehicle external mirror assembly according to claim 24 wherein the interior surface of both said front and rear shells are rough to improve adhesion to said foam.
26. A vehicle external mirror assembly according to claim 24 where said mount has a pivot assembly receiving portion, a vehicle body abutment and connection portion, and a body, said body comprising:
 - a moulded thin external plastic body shell; and
 - a second foam core, said second foam anchoring and supporting said body shell.
27. A vehicle external mirror assembly according to any one of claims 22, 23, 24, 25 or 26 wherein the stiffness of said diffuser reduces as it extends away from said mount.
28. A method for manufacturing a vehicle external mirror housing, for mounting a rear vision mirror, comprising the steps of:
 - moulding a first thin plastic component for use as a front shell;
 - moulding a second thin plastic component for use as a rear shell;
 - positioning and retaining said first and second shells against each other in an edge-to-edge relationship so as to create an internal void; and
 - substantially filling said void with foam to form a rigid assembly bonded together by said foam.
29. A method according to claim 28 wherein injection compression moulding is used to mould both of said front and rear thin plastic components.

30. A method according to claim 29 further comprising a sub-step of sandwiching a porous foam gasket between the edges of said first and second shells, whereby said gasket allows the escape of air but not foam from said void.

31. A method according to claim 30, wherein said second thin plastic component includes an aperture for receiving a motor mechanism assembly, further comprising the step of positioning said motor mechanism assembly over said aperture and wherein said foam bonds said motor mechanism assembly in position.

32. A method for manufacturing a vehicle external mirror housing, for mounting a rear vision mirror, comprising the steps of:
moulding a pre-form component;
blow moulding said pre-form component into a component having the external shape of a said mirror housing;
substantially filling said blow moulded component with foam to form a rigid assembly.

33. A method for manufacturing a vehicle external mirror housing, for mounting a rear vision mirror, comprising the steps of:
moulding a first thin plastic component for use as a front shell;
gas assist injection moulding a second thin plastic component for use as a rear shell;
positioning and retaining said first and second shells against each other in an edge-to-edge relationship so as to create an internal void; and
substantially filling said void with foam to form a rigid assembly bonded together by said foam.

34. A method according to claim 33 wherein injection compression moulding is used to mould both of said front and rear thin plastic components.

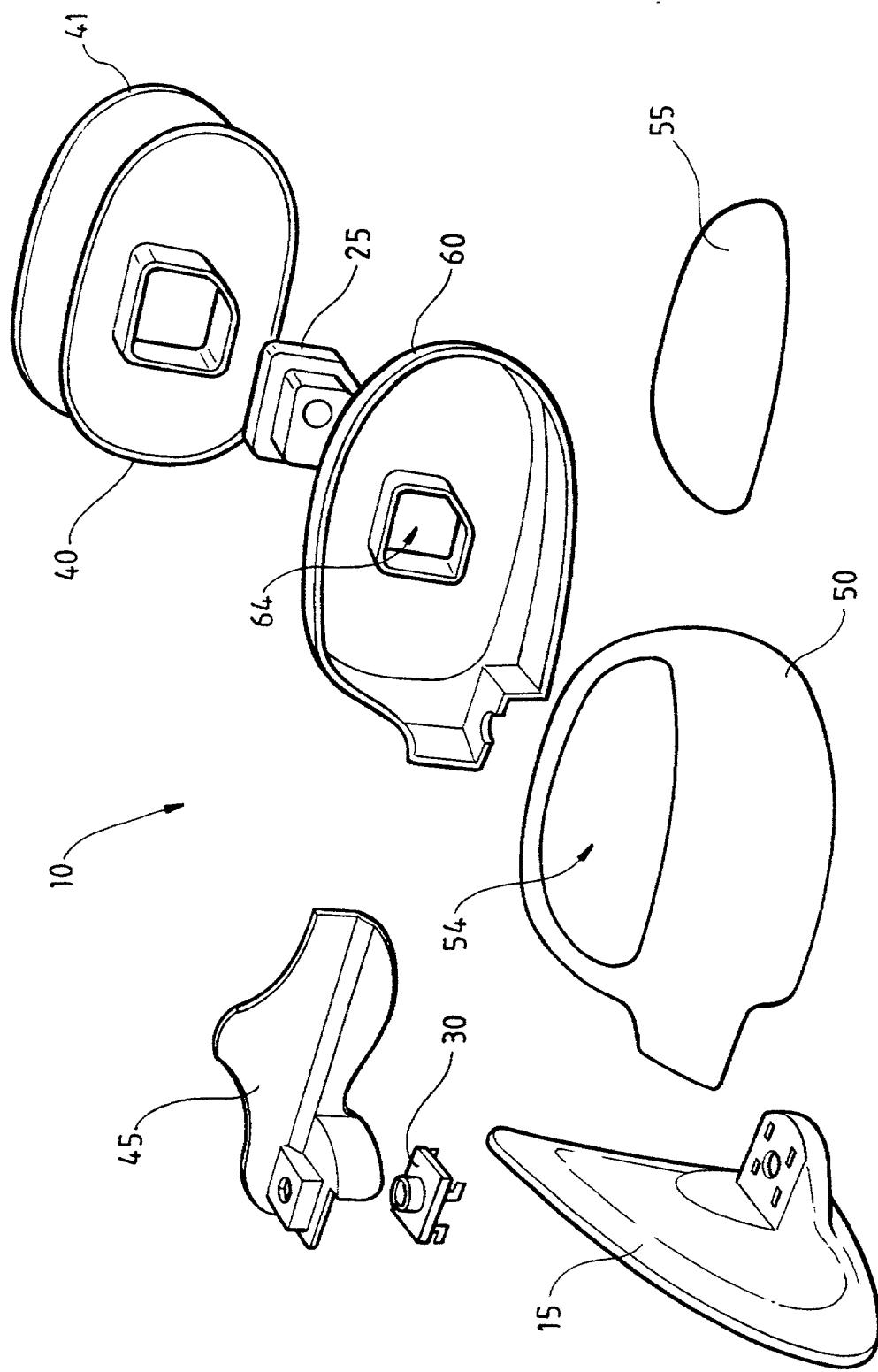
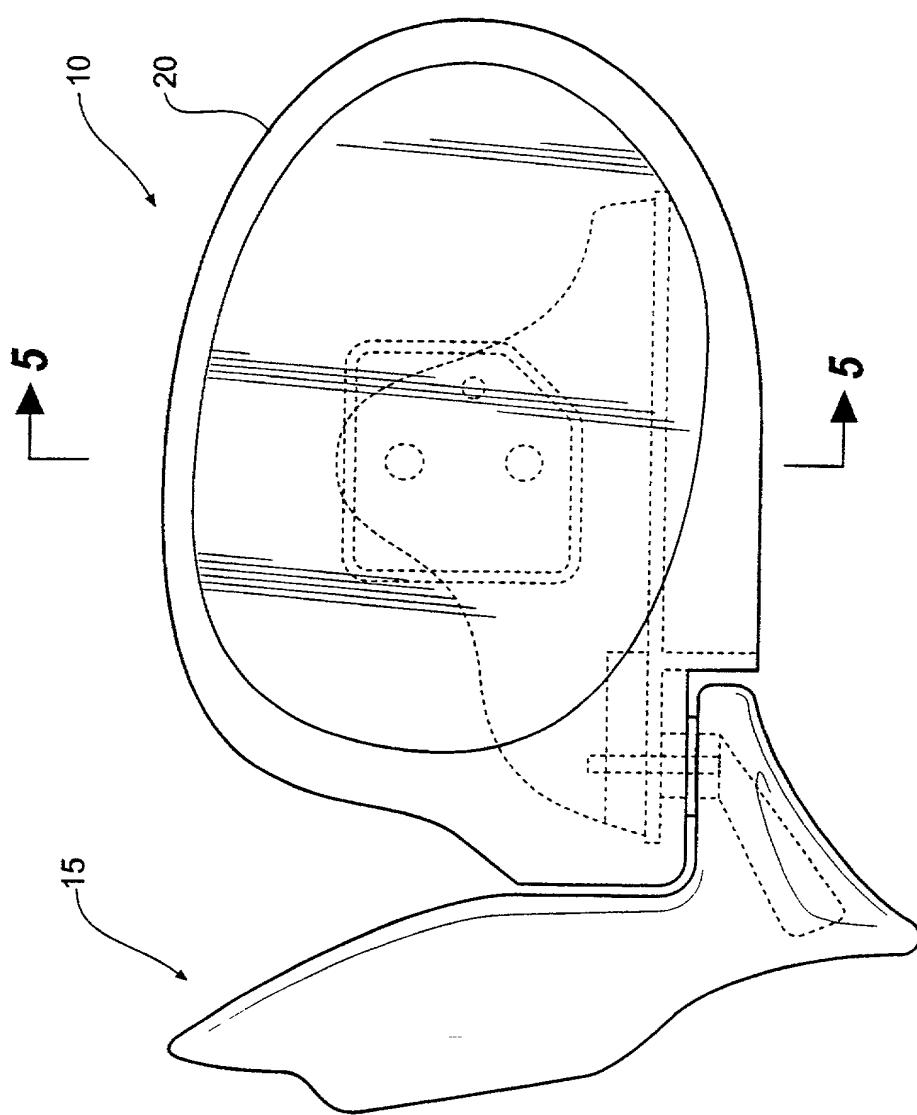
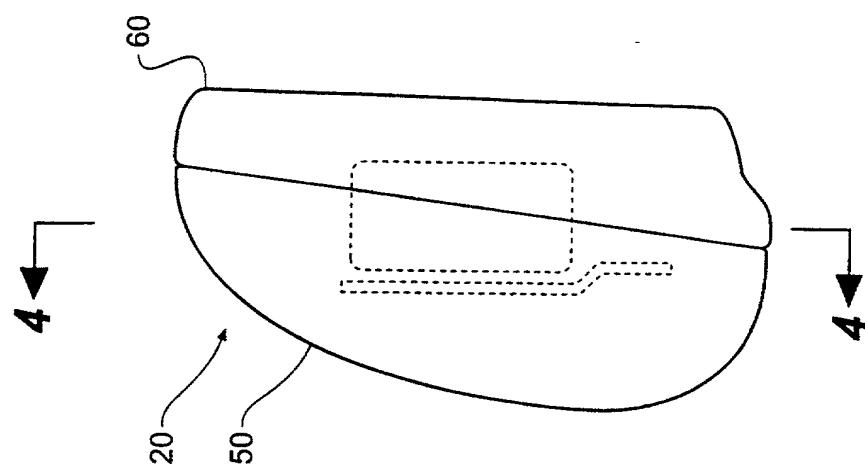


FIG 1



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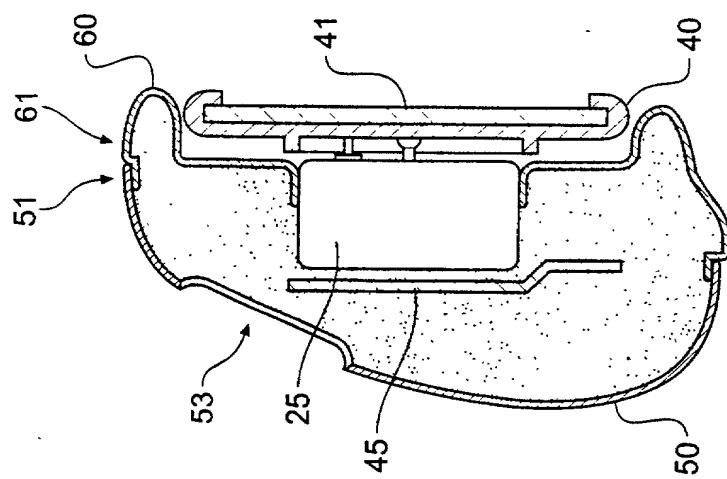


Fig 5

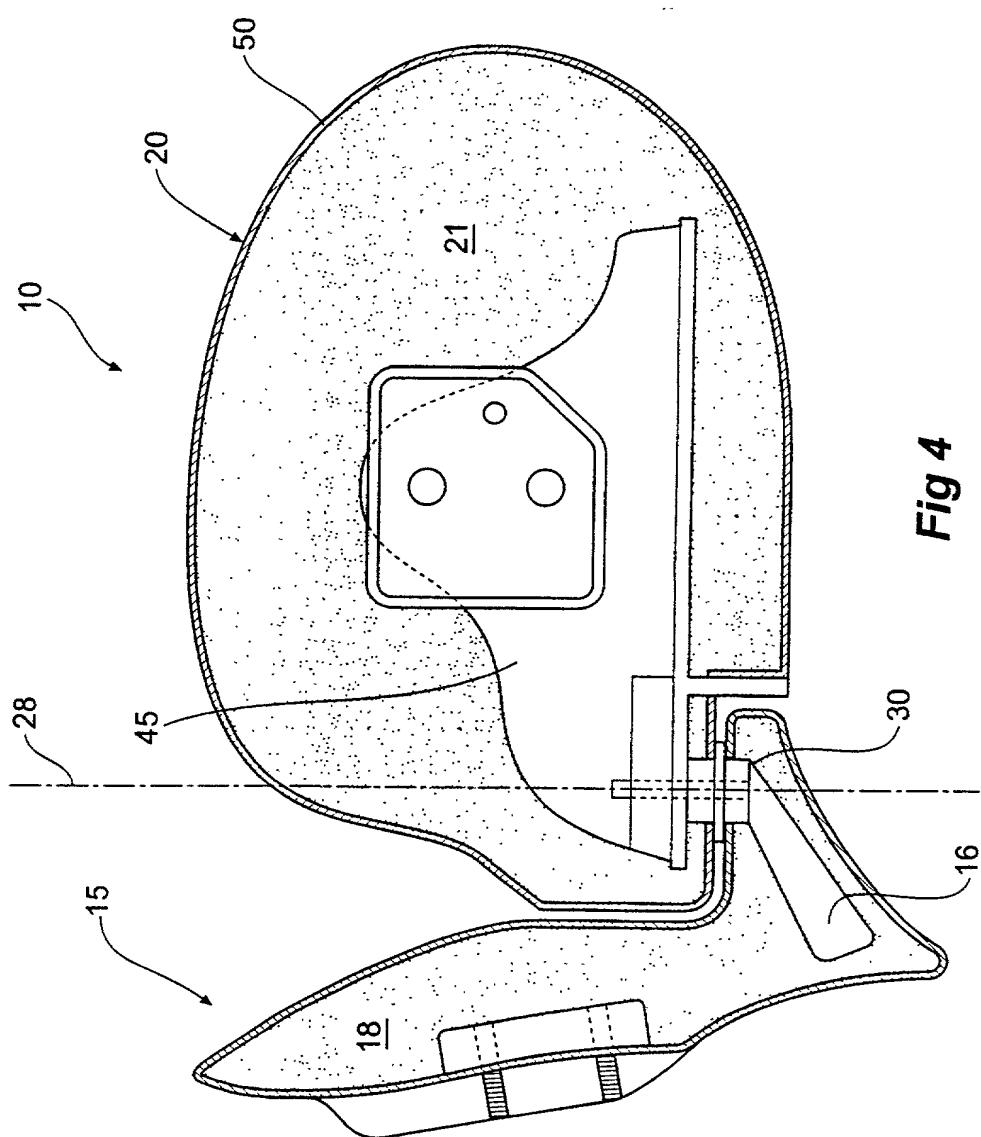


Fig 4

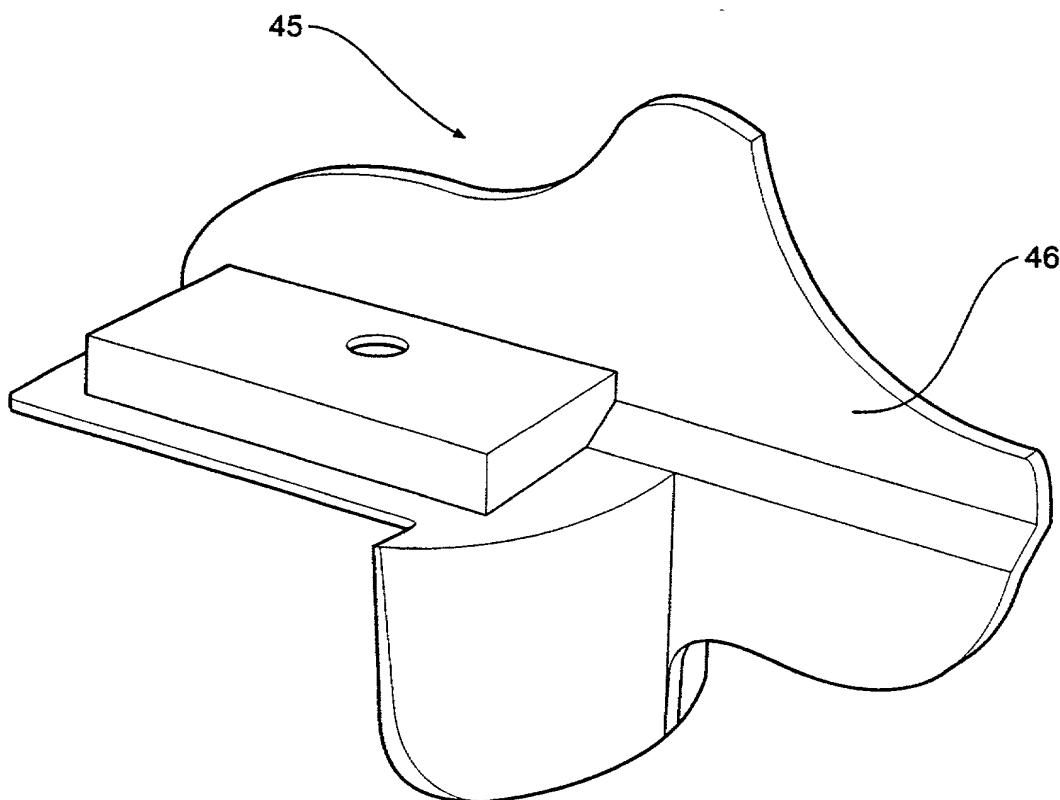


Fig 6

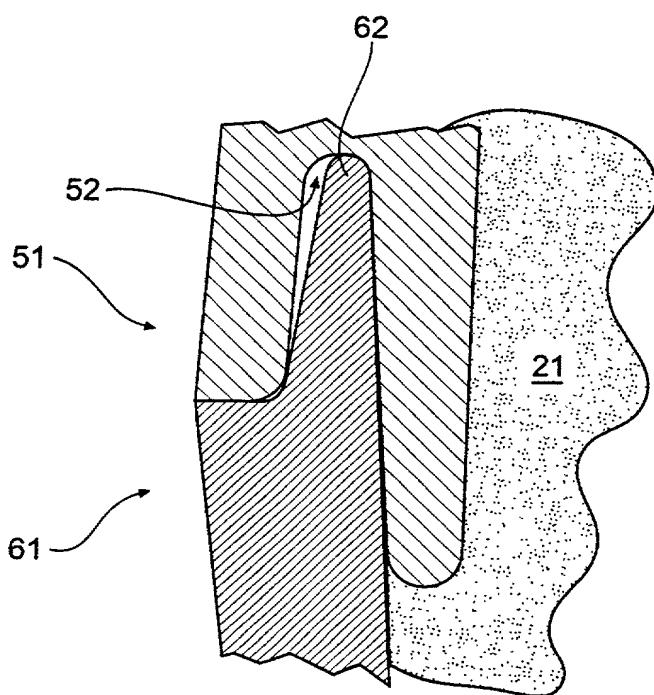


Fig 7

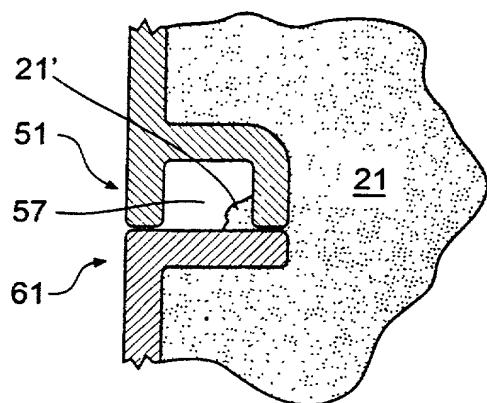


Fig 8

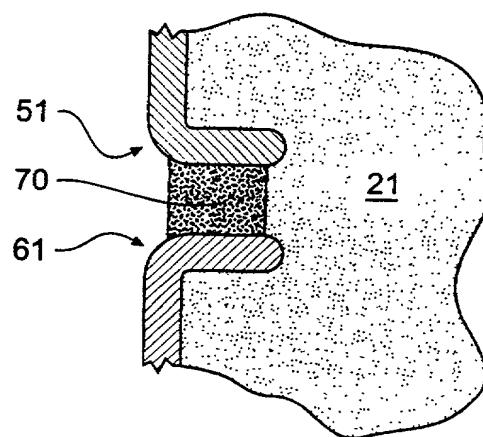


Fig 9

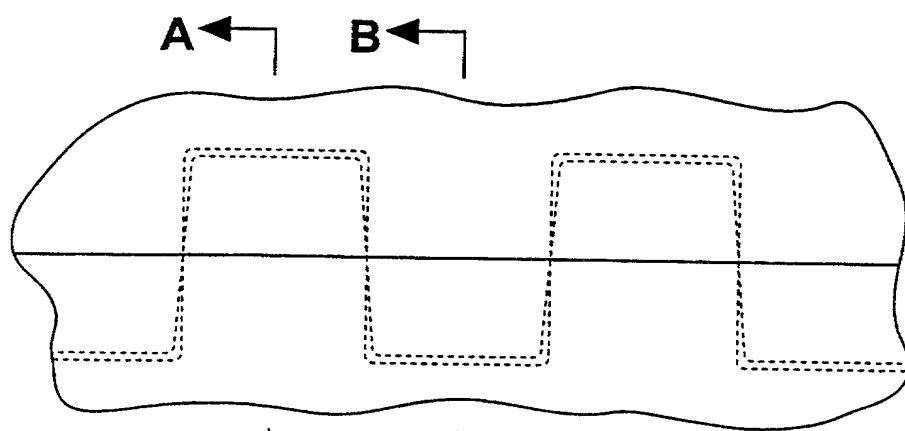


Fig 10

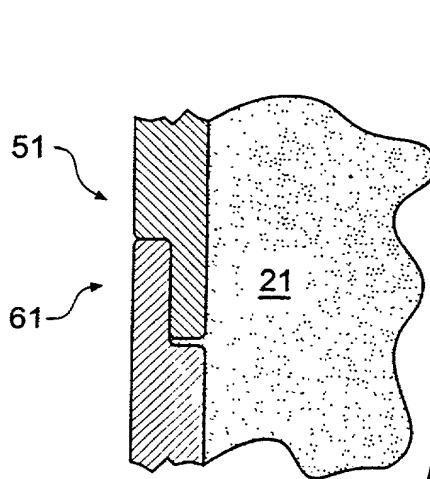


Fig 11

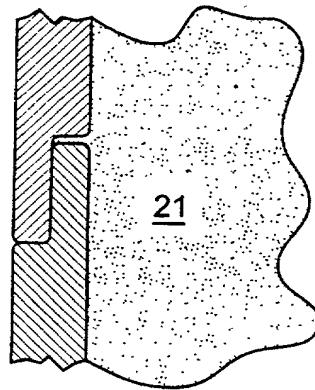


Fig 12

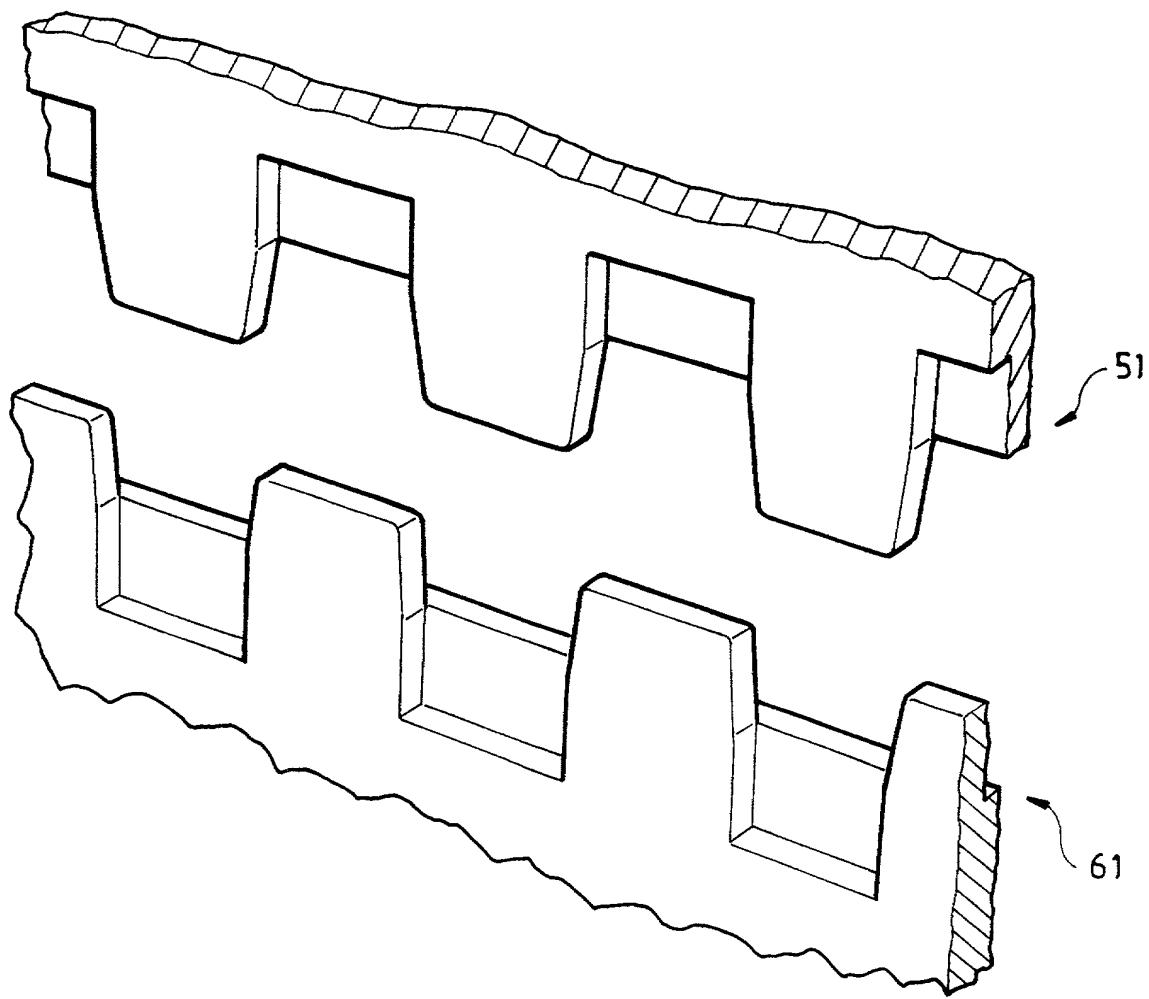


FIG 13

USA

Attorney's Docket No: _____

COMBINED DECLARATION/POWER OF ATTORNEY

AS BELOW NAMED INVENTOR, I HEREBY DECLARE THAT: This Declaration is of the following type:

Original Supplemental Continuation-In-Part
 Divisional Continuation National Stage of PCT

My residence, post office address and citizenship are below next to my name; I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled: "VEHICLE EXTERNAL MIRROR ASSEMBLY AND METHOD OF MANUFACTURE", the specification of which:

is attached hereto
 was filed on , as Serial No
 was amended on (if applicable)
 was described and claimed in PCT International Application No
PCT/AU00/00054 filed on 3rd February 2000
and was amended under PCT Article 19 on

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above. I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, Sec. 1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, Sec.119 of the foreign application(s) for patent or inventor's certificate or of any PCT International application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America files by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed:

Country	Appln No.	Day/Month/Year/Filed	Priority Claimed Yes	No
Australia	PP 8490	5 th February 1999	YES	

I hereby claim the benefit under Title 35 USC 120 of the United States application(s) listed below, and insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided in the first paragraph of Title 35 USC 112, I acknowledge the duty to disclose material information as defined in Title 37 CRR 1.56(a) which occurred between the filing date of the prior application and the national or PCT International filing date of this application:

Serial No.	Filing Date	Status

I hereby appoint the following attorneys and/or agents to prosecute this application and to transact all business in the U.S. Patent and Trademark Office connected with:

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MICHIGAN 48326
UNITED STATES OF AMERICA

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issue therefrom.

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Full name of sole or first inventor

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Date

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Residence

Australian
Citizenship

as above
Post Office Address